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Find the right home for your Haswell processor
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1TB SSD SHOWDOWN
New Samsung SSD challenges Crucial's dominance
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Android tablet/gaming-handheld hybrid needs work
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MAXIMUM PC

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More performance than desktops twice their size! PG. 26

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CLOUD STORAGE COMPARISON

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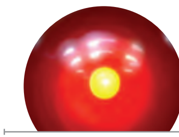
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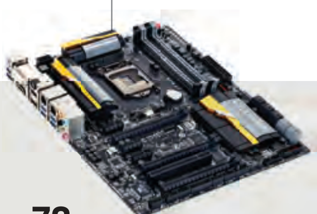


On the Cover
Photography by
Mark Madeo




2001: A Space Oddity









MORE +

MAXIMUM PC

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Gordon Mah Ung

I'M GOING GREEN

I RECENTLY BECAME concerned with my technology carbon footprint. Fortunately, I've realized that I already use the most ecologically sound computing device available: the desktop tower PC.

It's already been acknowledged by the industry that the upgrade cycle for the PC is very long and getting longer. My mother-in-law, for example, replaced her Dell tower desktop after nearly nine years of service. *Nine years*. In that time, I added a second hard drive and a bit of RAM but it was essentially unchanged from its original Pentium 4 state. We could have upgraded its internals but she instead decided to replace it with a brushed-aluminum all-in-one.

Now, I like all-in-ones but they are at a key disadvantage when it comes to carbon footprint. You can't upgrade them and usually when they go bust, the entire thing goes into landfill. The same can be said of the new generation of ultrathin notebooks. Often, the SSDs and RAM in these highly portable devices are soldered to the motherboard and the whole thing is then glued shut, so the only thing you can do when a part goes bad is landfill the entire unit. But I suppose they are still a far greener proposition than the tablet and smartphone movement.

Tablets have even worse serviceability than an ultrathin laptop, and they fall off the performance curve before you can unbox them. First-generation tablets from just two years ago are all but useless. If you don't replace your smartphone every 12 months, you're a loser or worse—not cool, the commercials say. It's easy too, with your carrier "subsidizing" a new phone for you every year. Even if you don't upgrade, the phone can't take the latest OS, which means it's riddled with security holes and won't even install the latest apps. Let's not forget the carbon footprint from sleeping in front of a store for five days to get the new thing.

And don't fool yourself into thinking that putting your old smartphone into the eWaste bin at Best Buy is helping—it's estimated that only 12.5 percent of eWaste is actually reclaimed.

Now, my desktop PC, I'm certain, will run the latest OS and it gets regular security updates. Even if I didn't upgrade my tower PC, I'm certain I could run it for the next nine years without issue. When I do get the itch for a new component—say, a future AMD or Intel 13-watt processor that's twice the speed of today's fastest CPU—I can replace that one specific component (with motherboard, of course) and reuse the rest of the parts for years on end.

Sure, analysts and the mainstream tech media might say that long upgrade cycle is bad, but that's because they want people to buy a new product every 12 months and throw away the old one. But I don't care; I'm trying to save the world with my desktop tower PC.



Gordon Mah Ung is Maximum PC's deputy editor, senior hardware expert, and all-around muckraker.

submit your questions to: comments@maximumpc.com

THE NEWS

Not Dead Yet

A recent report says PC gamers are holding the line against sagging hardware sales

YOU'VE PROBABLY seen the reports that Dell's revenue is down a whopping 70 percent versus the same time last year. Acer says it's walking away from the Windows platform. Everybody's launching a line of tablets, and obsessing over announcements of a new bauble from Apple or Samsung has become a national pastime. Mobile is sexy now. Who has time for PCs anymore?

A lot of people, apparently. According to a recent report from Jon Peddie Research (JPR), PC gamers are like sports car enthusiasts, "always looking for more speed, power, utility, and handling." A certain number of people have transitioned their email, video streaming, and casual games over to mobile devices, but this phenomenon is more of an extension of the computing experience, rather than a wholesale shift. When asked for comment, Mr. Peddie himself told us, "One of the misconceptions that—to my great annoyance—runs through the press and investment community is this football mentality that there is a winner and a loser, when in reality everyone is a winner. Except for the very poor, it is not (nor has it ever been) a case of console *or* PC for gaming, any more than it is a choice of smartphone or console or PC or tablet for game playing."

Globally, individual component sales have remained steady over the past couple of years. In recent informal talks with boutique shops like Falcon Northwest and Origin PC, we've learned that sales are as strong as ever (though admittedly, they would not be eager to report a sudden decline). JPR is projecting that demanding games such as Arma III are driving hundreds of millions of dollars in sales before they are even released, as gamers upgrade their systems (or build new ones from scratch) in anticipation of a jump in system requirements. This spring, Arma III's developer announced that the game would require a quad-core AMD Phenom II CPU, an Intel Core i5, or better.

Part of the sustained drive of hardware sales may be the unusually long lifespan of the current generation of consoles. Our editorial inbox gets a constant flow of people moving away from consoles and into PC gaming. However, Jon Peddie has a different perspective: "Intermediate buying is influenced more by titles than hardware. If EA, for example, released a killer console game, it would sell well, even though the consoles are 10 years old. Likewise, if they released a great PC game, it would sell, and might influence the upgrade-buying of a new graphics add-in board. But it's always the content that drives it, not the announcements of the [hardware] suppliers."

That said, the PS4 and Xbox One moving to the PC's x86 instruction set looks like a major shift. Says Peddie: "Now, since the processors will all be x86 with rich GPUs and modern APIs, and the new machines can support up to 4K screens, the graphics quality of games will be equal from day one and the PC release of the game will be the same day as the console release. AMD will be announcing a new development tool to make that even more possible (stay tuned, as they say)."

It looks like sales figures from Dell and other mass production OEMs don't tell the whole story, or even a clear one. –**Tom McNamara**



Upcoming PC games like Arma III look gorgeous—and will need gorgeous hardware.

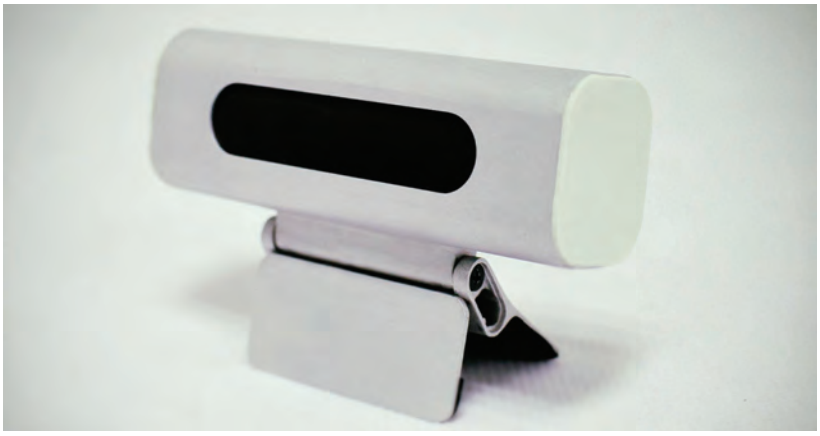
Acer Doesn't Do Windows



In December, Acer president Jim Wang said it was too early to say whether Windows 8 was a success or not. By this August, the Taiwanese company seemed to have found the answer. Wang announced in a conference call that, "We are trying to grow our non-Windows business as soon as possible. Android is very popular in smartphones and dominant in tablets.... I also see a new market there for Chromebooks." Despite all his eagerness, Wang admitted that traditional PCs are "the best IT device for productivity," with alternatives just not being good enough. "However, at today's stage, the user feels very puzzled. They need some convincing reason so that they will start to buy the real PC again." **–PC**

Intel's 1.6-Terabit Fiber

Intel and Corning announced in August that they were working on a 1.6Tb interconnect, designed for servers routing data through the cloud. This would be about 15 times as fast as the currently fastest technology, although actual network speeds would be around 400 megabits per second, or about a quarter of the speed that this technology would operate at within each server. Dubbed MXC, the technology uses fiber-optic cabling to achieve its speeds, though Intel was not discussing the guts of the design as this issue went to press. Nevertheless, this tech will likely filter down to desktop computers in the coming years, where it could shuttle graphics, RAM, and CPU data around your PC. **–TM**



Multitouch Everywhere for $70?

Tech website ExtremeTech reported in August that a startup called Haptix Touch is working on a device that turns any surface (presumably a flat one) into a multitouch interface—sort of like the Leap Motion (reviewed on page 86). It uses the same basic design as Leap, with two cameras tracking motion in three dimensions. However, the Haptix uses visible light as well as infrared light, which gives it higher tracking precision, according to company co-founder Darren Lim. Kickstarter funders appeared enthusiastic, despite the Leap Motion's lukewarm debut, hitting Haptix's $100,000 target within days. It's intended to have built-in Windows support, so the OS sees it as just another input device. Haptix is targeting a February 2014 launch. **–TM**



Tom Halfhill **Fast Forward**

SMARTPHONES GET THE LOVE

WHEN NEW camera technology appears first in smartphones instead of in cameras, it's yet another sign that mobile computing is driving innovation. Development dollars tend to favor the most popular or most profitable products, and right now smartphones and tablets are getting beaucoups love.

The latest example is a new image sensor from Aptina Imaging, a Micron spinoff in Silicon Valley. Aptina has introduced its first CMOS sensor using the company's Clarity+ technology, which takes a different approach to digital imaging. Clarity+ sensors will most likely appear first in smartphones before trickling down to cameras and other devices.

Why smartphones first? Because phonecams have become the most popular cameras among amateurs and are even making inroads among professionals. IDC market analysts estimate that compact-digicam sales will tumble to 80 million units this year, from 132 million in 2010. It's so discouraging that Olympus killed its entire compact-camera product line. But my day-job employer (The Linley Group) forecasts that 987 million smartphones will be sold this year. Which product would you target for a new technology?

Clarity+ changes the way an image sensor reproduces color. Digital sensors actually "see" in monochrome. Tiny red, green, and blue filters overlay the sensor sites that correspond to pixels, and these filters create the RGB primary colors from which billions of hues are derived. Since the 1970s, almost all sensors have used a color-filter pattern known as a Bayer matrix. Clarity+ uses a different pattern that doubles the sensor's effective sensitivity.

Bayer alternatives aren't new, and they often have drawbacks. Aptina claims to have overcome those flaws and is showing sample photos to support its claims. But the significant news is that the new technology will appear in smartphones within a year or so, and only later may come to cameras. The stars have realigned.

Tom Halfhill was formerly a senior editor for *Byte* magazine and is now an analyst for *Microprocessor Report*.



Thomas McDonald
Game Theory

POWER USERS GET BACK IN THE GAME

THE JON PEDDIE Research report about the uptick in sales of high-end graphic processors has been getting a lot of attention lately. The take-away appears to be little more than a tautology: PC power users are acting like PC power users.

I was pleased to see it note the obvious—that PC gamers "buy and build with a fervency that could be compared to motorcycle, 4x4, and sports car enthusiasts, always looking for more speed, power, utility, and handling"—but we knew that already. They just hadn't been spending as much lately.

But as PCs lose ground to tablets, any good news is welcome, and the news is this: A new generation of better, more expensive cards is finally giving power users a solid reason to upgrade. After the downturn in the economy, people weren't plowing as much spare cash into their towers, and likely were putting off upgrading for longer than they might normally. Add in the uptick in good PC-intensive titles and you have a common-sense recipe for a surge in hardware sales.

But let's not kid ourselves: that's *us*: the intense, hobbyist market. It's not the mainstream. I have watched PC gaming go from niche to mainstream and back to niche since I was a 13-year-old with a TI-99/4. Mainstream was nice: big budgets, plenty of titles, and design elements that drove the entire gaming industry.

And now it's gone, and that's OK, too. Peddie is predicting continual growth of 3 percent in the graphics market through 2016 and beyond. How many power users do they imagine there are, and do they expect them to buy a GTX Titan every year?

PC gaming thrives at the high and low ends: the power users and the indies. We haven't been seeing as much from (or for) the power users lately. Turns out they were just waiting for a reason to get back in the game.

Thomas L. McDonald is Editor-at-Large of Games Magazine.

Lawsuit Brews over Surface RT

Law firm Robbins Geller Rudman & Dowd proposed a class-action lawsuit against Microsoft in August, accusing the company of making misleading statements in regards to its financial performance and Surface RT in particular. (Recall that MS waited until its Q4 2013 earnings report to reveal that the company would take a $900 million charge on unsold inventory.) As this issue went to press, Microsoft had not revealed how many Surface RT tablets it has sold. The lawsuit states, "What Defendants knew, but failed to disclose to investors… was that Microsoft's foray into the tablet market was an unmitigated disaster, which left it with a large accumulation of excess, over-valued Surface RT inventory." **–PL**



Xbox One Gamepad on PC in 2014

Sister publication CVG.com reports that Microsoft is working to make its Xbox One gamepad compatible with Windows, but that MS does not expect that feature to be available until next year. According to a rep, "The Xbox One controller, although it looks similar in many ways, shares no underlying technology with the current Xbox 360 controller. New wireless protocol, combined with the ability to work in 'wired' mode, and the addition of features like Impulse triggers, means that new software has to be written and optimized for the PC." **–TM**

Tech Tragedies and Triumphs

A monthly snapshot of what's up and down in tech

TRIUMPHS

AMD
It promised a software fix for its multi-card frame-pacing issue, and delivered the goods with Catalyst 13.8 Beta.

HUMBLE BUNDLE
The popular "pay what you want" game bundle comes to EA's Origin finally, and earns over $5 million.

INTERN CHRIS ZELE
Our intern for the past year has landed a gig at *PC Gamer*. We have empty nest syndrome already.

TRAGEDIES

MICROSOFT
Releases, then recalls, six patches on Patch Tuesday after a range of problems encountered by users.

FIREFOX
Data shows Firefox usage dropped 11 percent this summer, which is good news for Chrome.

TOUCHSCREEN LAPTOPS
In the wake of poor Windows 8 sales, analysts admit they overestimated demand for touch devices. How shocking.



Quinn Norton
Byte Rights

PANOPTICON EARTH

THIS YEAR, we've learned a lot about our Internet, and they've been hard things to learn. We learned the shape of the surveillance machines. We knew they were out there, but now they are no longer abstractions; they are real and concrete and they touch most of humanity. We learned that no one is free of them, not from the moment they have a phone, or a computer, or even a bank account.

I can't find any jokes right now.

On August 9, our president told us, "I am comfortable that the program... is not being abused." Less than a week later, a leaked report showed thousands of violations, and we still don't know what the unleaked reports say.

It's not just America. The "Five Eyes" cooperation probably puts taps on damn near the whole net, and probably so do other governments that have the equipment to get to cables and satellites. In doing this, they make all humans suspects of the crime of reaching out to one another. They make the desire for privacy a form of solitary confinement.

I have no joke here. My snark is failing me.

It seems hopeless. The forces here are so huge, and we are so small, living our lives on Panopticon Earth. Easier to just not think about it, just never talk about it. But this is the task of our time. We have to redefine privacy, and togetherness, to work within our networks. We need to care for each other, and help each other, and reject solitude. We need to redefine outrage. We need to not be manageable. We need to be loud. We need to protect each other in thousands of little ways. We need to redefine political reform, and failing that, we need to redefine political resistance.

Quinn Norton writes about copyright for Wired News and other publications.

Netgear Sues Asus over Routers

According to a complaint filed with the FCC and subsequent lawsuit, Netgear says that Asus's RT-N65U and RT-AC66U routers emit higher-powered wireless signals than what the FCC allows. Netgear further alleges that Asus conspired with QuieTek Corporation, an independent testing laboratory, to submit false test results to the FCC to ensure certification as part of a grand plan to eliminate Asus's competitors from the wireless market. A stronger signal extends the device's range—but if Netgear's allegations are true, it means the routers in question could also interfere with other electronic devices and potentially pose a safety hazard.

We reached out to Asus for comment but have not heard back as this issue goes to press. That means we only have Netgear's side of the story, and there's plenty to tell. David Henry, vice president of product management for Netgear's retail business unit, provided the following statement to *Maximum PC*:

"After Netgear filed its formal complaint and lawsuit against Asus in July 2013, the company released a new firmware update for both routers mentioned in the lawsuit. Typically, when Asus releases updated firmware they continue to provide access to previous versions, but Asus has deleted all of its old firmware from their website for each product. One month ago, they had seven firmware versions available for each product and today only one (RT-N65U) or two (RT-AC66U) are available. People can draw their own conclusions about what that means, but we find it very suspicious that they would do that." **–PL**



Windows Live Marketplace Closes

Microsoft closed its Windows Live Marketplace on August 22, but MS said that the Games for Windows Live service and games will still function as normal for the foreseeable future, and you will still be able to download your content via the GFW client. This move is part of an Xbox 360 system update that will convert Microsoft Points to money. MS says that users who still have points will obtain money "equal or greater" than the value of their points. Microsoft initially indicated that the service itself would shut down in July 2014, but that information was quickly scrubbed from the GFWL website as this issue went to press. **–PL**

USB 3.1 Is Official

The USB 3.0 Promoter Group has announced that the USB 3.1 specification is complete. The new spec boosts SuperSpeed USB up to 10 gigabits per second, doubling USB 3.0's theoretical limit of 5Gb/s. The group cites more efficient data encoding as the main reason for the jump in transfer speed. As with previous versions of the protocol, USB 3.1 will be backward-compatible. Intel's Thunderbolt is still faster, offering speeds of 10Gb/s per channel for a total of 20Gb/s. Thunderbolt can also take advantage of daisy-chaining without hubs, something USB can't do. However, USB is a much more widely adopted standard, giving it a significant edge in compatibility. **–PL**

THE LIST

8 MOVIES THAT PREDICTED THE TECH FUTURE



8 BACK TO THE FUTURE II:
Marty's JVC Glasses looked funny, and a lot like today's Google Glass and Oculus Rift.



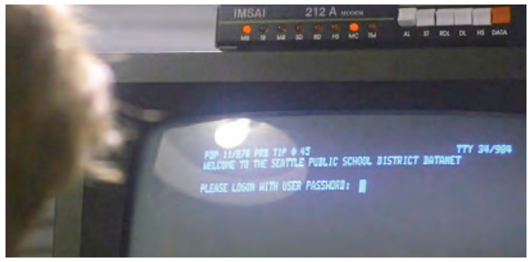
7 TOTAL RECALL
Self-driving cars seemed crazy in 1990, but Google's already deployed them to three states.



6 STAR TREK
The tricorder is easily one of the most obvious inspirations for today's handheld gadgets.



5 BLADE RUNNER
Huge digital billboards seemed garish in 1982; now they are just part of city life.



4 WARGAMES
In 1983, war dialing, cyber warfare, and hacking seemed cutting-edge. Now it's kid's stuff.



3 WEIRD SCIENCE
The concept of 3D printing first appeared in this 1985 classic, and is now a reality.



2 SHORT CIRCUIT
Johnny 5 was a military robot, which now exist as Unmanned Ground Vehicles (UGV).



1 2001: A SPACE ODYSSEY
The HAL 9000 robot was an early form of Siri. Surely she'll never go rogue.

HEAD TO HEAD

BY JOSH NOREM

Samsung 840 Evo 1TB vs. Crucial M500 1TB

Before 2013, the notion of a 1TB SSD was something geeks included in their wildest gear fantasies along with quad-SLI Titans and an Internet connection faster than Google's. Then the Crucial M500 1TB SSD came along at $600, and suddenly the fantasy became a semi-affordable reality. Now Samsung has joined the party with its $650 Samsung 840 Evo 1TB, hoping to knock the Crucial M500 off its perch and take 1TB SSD bragging rights. NAND... fight!!



Crucial's M500 SSD is a truly affordable, very fast, all-purpose SSD.

Round 1: Price

The Samsung 840 Evo 1TB costs $650 and the Crucial M500 1TB costs $600, so it's an easy win for Crucial, right? If you thought we'd say, "Nope, not so fast" you were wrong. This *is* an easy win for Crucial—no matter how you slice it, the Crucial drive costs less, and it's a major advantage, too, because consumers are incredibly price sensitive. Obviously, Samsung knew what the M500 cost before pricing its own drive, and it feels that the extra $50 is worth it, and to a lot of people, it might be. For example, the Samsung drive includes excellent software that is useful and well-made, while the Crucial drive includes jack-diddly in terms of software. The Samsung drive also has better performance, but the Crucial is certainly fast enough for any user.

Winner: Crucial M500 1TB

Round 2: Performance

This is the category we probably all care most about, and in this respect the Samsung drive takes the win narrowly, thanks to the inclusion of two unique caching technologies. The first is called TurboWrite, and it works by taking a chunk of MLC NAND and treating it like "virtual SLC" NAND. The second is called Rapid Mode, and it utilizes the host system's DRAM for caching, allowing it to hit incredible 1GB/s write speeds and produce seriously impressive read speeds, as well. Not only is it faster in a straight line, but also in real-world tests, 4K random writes, and PCMark, giving Samsung an easy victory. However, keep in mind that the stratospheric scores you see are only for cached data, and when the "normal" Samsung 840 Evo is compared to the Crucial M500, the two are extremely close.

Winner: Samsung 840 Evo

HEAD

BENCHMARKS

	Samsung 840 Evo (Rapid Mode)	Samsung 840 Evo (Normal Mode)	Crucial M500
CrystalDiskMark			
Avg. Sustained Read (MB/s)	**603**	515	464
Avg. Sustained Write (MB/s)	**595**	504	333
AS SSD - Compressed Data			
Avg. Sustained Read (MB/s)	**697**	501	493
Avg. Sustained Write (MB/s)	**977**	496	439
Iometer			
4KB Random Write 32QD (IOPS)	88,944	**89,772**	70,654
PCMark Vantage x64	**67,113**	57,809	52,557
Sony Vegas Pro 9 Write (sec)	**277**	**277**	435

Best scores are bolded. All tests conducted on our hard drive test bench, which consists of a Gigabyte Z77X-UP4 motherboard, Intel Core i5-3470 3.2GHz CPU, 8GB of RAM, Intel 520 Series SSD, and a Cooler Master 450W power supply.



The 840 Evo has a few tricks up its sleeve that have never been seen before in the SSD world.

Round 3: Software

This is another easy win for Samsung, as it provides a totally comprehensive software package while Crucial provides the bare minimum by only giving you the ability to flash the drive's firmware and nothing else. Crucial's position of "no software" would have been totally fine a year or two ago, and is probably fine for most users even now, since the drive will keep itself optimized automatically via Trim, and operates without any user input, but the Samsung Magician software is so useful that it sets a new standard. It shows you drive health, whether AHCI is enabled in the BIOS, interface speed, and shortcuts to optimize your drive, Trim it, and more. It even shows you the total amount of data written to the NAND, which is fun to examine from time to time, at least for people like us.

Winner: Samsung 840 Evo

Round 4: Warranty/ Longevity

This is a close one, as both drives come with a three-year warranty. Since that's a tie, let's examine NAND life expectancy. Crucial rates the 20nm Micron MLC NAND in the M500 at 40GB per day for five years or 72TB, whichever comes first, and it offers a 1.2 million hour MTBF. Samsung doesn't specify any such numbers for its 840 Evo, but it estimates that the TLC NAND inside is good for between 1,000 to 3,000 program erase cycles, which is beyond what most consumers would ever be able to do by a factor of 10. Some will say the Samsung's TLC NAND makes it less reliable than the Crucial's MLC, but that's never been proven in the real world. Without any specific numbers or data that shows either of these drives to be unreliable, and since they have the same warranty, this round is a tie.

Winner: Tie

Round 5: Bundle

The bundle is everything else that comes with the drive in question, so let's look at each drive one at a time. For the Crucial M500, we get a 2.5mm spacer that lets the drive fit into some older laptops with a 9.5mm hole, and that's it. There is no software and no 3.5-inch bay adapter. The Samsung 840 Evo stand-alone unit we tested has just a single CD in the package, but that CD contains two very useful programs: the aforementioned Samsung Magician and a Data Migration tool you can use to clone a volume to a Samsung SSD. Overall, both of these drives' "bundles" are very weak—we would appreciate a 3.5-inch bay adapter at least. Since Samsung does provide a software CD, it gets the nod by a margin as thick as the CD itself.

Winner: Samsung 840 Evo

And the Winner Is…

It was close, but in a 3-2 upset, the **Samsung 840 Evo** takes the win. It's clearly the overall best 1TB SSD available due to its incredibly well-rounded package of a decent price, record-setting performance, and a full suite of useful software. The M500 has a lot going for it though, including a ton of speed and an amazing price, but it's a one-trick pony compared to the Evo at this time.

DOCTOR

THIS MONTH THE DOCTOR TACKLES...

> Big Coolers
> Old Motherboards
> IVB vs. SB-E

Too Big?

In the August 2013 issue you indicate that using a third-party, aftermarket CPU cooler is a good idea. I have always had a concern about cooler and fan weight damaging the motherboard. I build in mid- or full-tower cases and it seems that having so much weight hanging from the motherboard risks damage. Is this a valid concern? I would probably use one of the Thermalright coolers designed for an AMD FX-series CPU.

—Rich T.

THE DOCTOR RESPONDS: The bigger aftermarket coolers can weigh upward of two or three pounds, so it's not impossible for a heavy cooler to damage your motherboard. This is why modern CPU heatsinks now have solid backplates that you install on the other side of the motherboard, that distribute weight and help prevent damage to your board. As long as your cooler fits in your case and is installed correctly, it shouldn't damage your motherboard in the course of normal operation. That said, don't go knocking over your computer. If you're shipping your machine, or travelling with it (for example, going to a LAN party or moving across town/state/country), it's a good idea to remove your CPU cooler, graphics cards, and hard drives and package them separately. Otherwise, if they get loose or torque, they can damage themselves or your motherboard.

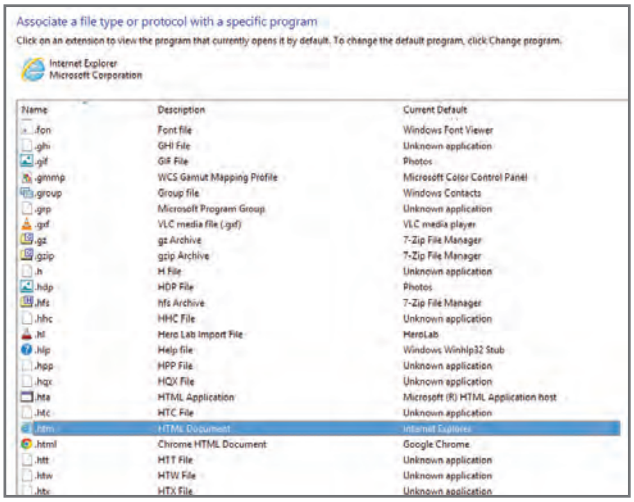
Downloading: SSD or HDD?

I could use some advice on torrents. Whether I am downloading them or uploading, I'm constantly reading and/or writing data from my storage. Would it be better to keep torrent files on the SSD or the HDD? I believed that an SSD would be the best option, but a friend said a hard drive would be best for such a job. My friend also mentioned that SSDs have shorter life spans than hard drives, which is all the more reason to use an HDD. Is this true as well?

—Alex Lee

THE DOCTOR RESPONDS: Your friend is right—kind of. If you're downloading a lot of torrents, you're writing many gigabytes of data, in many small chunks, in an application where drive speed is not relevant. Your torrent download and upload rates are limited by your network settings and those of your peers, not the speed of your drive. A hard drive has a lot more storage for the dollar. You can get a 4TB HDD for less than the price of a 256GB SSD.

Endurance of SSDs is really a canard at this point. They do technically have a shorter life but to wear out an SSD would take so much data that it's highly unlikely a person would ever hit that threshold. The controller would likely quit before the NAND would—but you'd never download enough torrents to find that out, because either your ISP would cut you off or a Flowers By Irene truck would roll up to your house before you could reach that point. Still, given the price of hard drives today and their mammoth capacities, it makes a lot more sense to just store those Linux distros you're downloading on an HDD. Save your SSD's capacity for your OS, programs, and games—where their relative speed can shine.



There are multiple file extensions for HTML documents; if one is set to open in a different program, it can cause problems.

File Extension Blues

I have a strange problem in Windows 7. It relates to a file association. At least, I think it does. I use a program called DVDFab (great program, by the way), and when it starts and there's an update available it asks if I want to get the update. When I click "yes" it doesn't take me to the site but instead opens my HTML editor. This happens with any program that

↘ submit your questions to: doctor@maximumpc.com

asks to update. I can't figure out where to change the association. Can you help?

—Carla

THE DOCTOR RESPONDS: It sounds like Windows is configured to open certain web extensions in your HTML editor rather than your browser. For example, Windows treats .htm and .html as separate file types and allows you to assign different default programs to each extension. Next time it happens, make a note of the file extension of the page your HTML editor opens. Then go to Control Panel and select Programs. Under the Default Programs heading, select "Make a file type always open in a specific program." Scroll down until you find the file extension you're looking for, and double-click it. Choose your web browser from the list of options that pops up, and you should be all set.

AM3+ on My AM3 Board?

Will my aging AM3 board (Asus M4A77D) play nice with an AM3+ FX-8350 (Vishera 4GHz, eight-core)? I've read that although it is an unsupported configuration it can work.

—Paul de Campo

THE DOCTOR RESPONDS: Don't try it. The Doctor isn't sure where you read that it can work, but the Doc wouldn't recommend it. Some Asus AM3 boards can be updated to AM3+ via a BIOS update, but your mobo isn't one of them. The BIOS for the M4A77D hasn't been updated since 2010, and your board doesn't support 6Gb/s SATA or DDR3. The chip may work and the box may POST but the experience can be wonky when the CPU is not supported by the BIOS. The Doc recommends that you do a board upgrade, as well, if you intend to run a Vishera.

PC Making Me Go Bald

My PC display freezes randomly (like pausing a DVD player) and I have to manually shut down my machine. Drivers are up to date, nothing shows up in error reports, no luck with any Windows troubleshooting, etc. I'm hoping you might be able to point me in a direction to look. I'm about ready to pull my hair out! I have a Core 2 Duo Q6700, MSI G41M-P34 motherboard, MSI N550GTX Ti graphics card, 8GB G.Skill DDR3/1066, and 64-bit Windows 7 Home Premium.

—Tom Zeis

THE DOCTOR RESPONDS: Try uninstalling the Nvidia drivers and reinstalling the latest drivers for your GPU from GeForce.com. You can use the "Auto-detect your GPU" option at www.geforce.com/drivers to make sure you're getting the right ones. Be absolutely sure you've uninstalled any existing drivers first.

If the problem persists, it could still be your video card, but it might also be the RAM. Download Memtest86 from www.memtest.org, make a bootable CD or USB, and run it overnight to check your RAM for errors.

If there's nothing wrong with your memory, it could be a problem with your video card itself, or a problem with your connection. Shut down and unplug your computer, open up the case, and remove the graphics card. Make sure the fan isn't clogged with dust, and that there isn't dust in the PCIe slot or on the card's PCIe connector, then carefully reinstall the card.

If that doesn't work, you can try uninstalling the Nvidia drivers, downloading the Intel integrated drivers from MSI's website, removing your GPU, and setting your computer to use the integrated graphics instead. If the problem goes away, it was definitely your video card. If it persists, it's probably your motherboard. Oh, one last thing—this is dumb, but make sure your monitor cable is plugged into your GPU's video ports when you're using your GPU, not the ports from your motherboard.

Deleting Windows after Installing Chromium

To free up disk space, I want to remove my previous Windows Vista installation on an old PC after installing Google Chromium Vanilla. How do I do this?

—Sonny Starks

THE DOCTOR RESPONDS: Have you already installed Chromium Vanilla into a separate partition, or are you planning to install it, and then remove Vista?

If you haven't yet installed it, you should know that you can choose to install Chromium Vanilla so that it dual-boots with your existing OS, or install it as the only OS, in which case it will overwrite your Vista partition during the install process.

If you have already installed Chromium alongside Vista, you have two choices: Delete the Windows partition manually with a partition manager, then expand the Chromium partition to take up the newly freed space, or just reinstall Chromium Vanilla and choose the option that makes it your only OS. Since the whole point of Chromium is to act as a mostly cloud-based OS with everything synced to your Google account, you shouldn't lose any data, and it'll be easier than messing with a partition manager.

Getting Ready for Prime95 Time

When running Prime95, do I need to make any changes in the cooling system? I'm using the Corsair H100i. My system is based on the Performance Build in the Oct 2012 issue, with a few changes such as the CPU cooler. The case is a HAF 932 Advanced, and the PSU is a Cooler Master 850W Silent Pro. Everything else is the same.

—James K Gillette

THE DOCTOR RESPONDS: We mostly use Prime95 to make sure our CPUs are stable with the clock speeds, voltages, and cooling choices we've selected. The only reason you might need to change your cooling system is if your CPU frequency is throttling due to high temperatures (usually above 90 C) when you run Prime95. And you'll find that out soon enough.

Trading Ivy Bridge for Sandy Bridge-E

I have a gaming rig with a Core i5-3570K, 16GB of RAM, an EVGA GTX 660 SC, and a 750W PSU. I'm pretty happy with all my hardware, but I'm considering upgrading to Socket LGA2011. I just can't decide if it's really worth upgrading if I'm mostly using the rig for gaming. If it is, should I grab an Ivy Bridge-E when they come out or grab a Sandy Bridge-E when they go on sale?

—Jesse Pearce

THE DOCTOR SAYS: Don't get caught on the upgrade treadmill; switching sockets is not worth it for a gaming rig. You have a fantastic unlocked quad-core Ivy Bridge CPU that's more than enough for any game you're going to play for the next four years, plenty of RAM, and a decent video card. If you really want to upgrade your rig for gaming, take the money you would spend on replacing your CPU and motherboard and put it into a second GTX 660 SC. Doubling up on your GPU will give you roughly twice the graphics performance for around $225. The Sandy Bridge-E Core i7-3820 CPU, which is only slightly better than your existing i5-3570K, is $300, and that's before you buy the motherboard. A GPU upgrade is your best bet. If you don't have an SSD for your OS and games, consider one of those, as well. Also, Sandy Bridge-E isn't likely to see much of a price drop when Ivy Bridge-E comes out, as Intel is pretty good at running down inventories to prevent overlap.

March of the

A new breed of petite PCs proves that you can have serious performance in a small package

BY GORDON MAH UNG

ASK A CIVVIE what a gaming PC is and they'll say it's a machine slightly smaller than an HVAC system that breathes fire. That, gentle readers, is no longer the case. Alienware planted the seeds of a revolution with its first X51 by shoehorning a real GPU into a machine the size of a VCR. And in the year-and-change since then, interest in micro-towers has exploded.

And why not? Micro-tower machines can offer 90 percent of the performance of a full-tower box while taking up less room than the original Xbox. While we often see micro-towers as the perfect "Steam Box" to displace those milksops of an excuse for gaming



Micro-Towers

machines called consoles, they're also finding popularity in space-constrained NYC apartments and college dorms, since plenty of us still want the performance of a "real PC" but don't want to pay the space premium for them.

Now, don't confuse micro-towers with the longstanding Shuttle-style small-form-factor PCs shaped like shoeboxes, or other small boxes of that ilk. No, for this roundup, we wanted to focus solely on machines that are as compact as a console but with the graphics grunt of a full tower. With that said, let's see how these little tykes perform.



IBUYPOWER REVOLT

PHENOMENAL PRICING; NOT-SO-GREAT STORAGE

One of the problems of showing off any OEM system to DIYers is they invariably snort, and then cinch up their belt up before loudly pronouncing to the room, "Hell, I could do it better *and* cheaper!"

That's when iBuypower steps in and crushes their little armchair system-builder fantasy like a fire truck rolling over a Diet Coke can. You still don't believe us, do you?

Well, just give iBuypower's Revolt a spin: This micro-tower features a GeForce GTX Titan, Core i7-4770K, NZXT Kraken X40 140mm liquid-cooling, 8GB of DDR3/2133 RAM, ASRock Z87E-ITX board, 500-watt PSU, slot-load DVD burner, 1TB SATA 7,200 HDD, 120GB SSD, and Windows 8. Oh, yeah, there's also a three-year warranty and lifetime phone support, to boot—all for $2,000.

Don't think we didn't try to beat iBuypower, either. We spent half an hour on PCPartpicker.com trying to game out scenarios to beat iBuypower at its price/performance game and we just couldn't do it. And that's not even mentioning that you can't get iBuypower's custom micro-tower case anywhere, either. So, Bubba, just pack up your, "I can do it cheaper " talk and walk on down the road.

Of the four systems here, the Revolt is actually the portliest of the bunch. Not by much, but when the Alienware X51 R2 and Digital Storm Bolt are each 3.75 inches wide and the Falcon Northwest Tiki is 4 inches, the Revolt looks noticeably bigger at 4.75 inches.

One feature of the case we really appreciate is its ability to rest vertically or horizontally. Only the Alienware and iBuypower support both orientations out of the box. Digital Storm offers an optional attachment at an extra cost and the Falcon only sits vertically. The Revolt's case features pulsating LEDs integrated into both sides that can be manually switched to different colors or plain shut off. It's a nice effect but not as impressive as the Alienware's ability to set the LED colors individually.

We know that micro-towers save space at the expense of serviceability, but we still wanted to know what it's like to get into each machine's innards. By sliding off the side of the Revolt, you can access the drives and PSU. To get to the actual guts of the box, you'll need to pull the PSU, unscrew a metal plate, and carefully tilt it out. From there it's easy to access the DIMMs and CPU. Pulling the GPU requires unscrewing it from the back plane to slide it out. Overall, it's not a bad service job if you decided to replace the RAM or upgrade the Core i7-4770K down the road. Of the four systems, though, it's probably at the bottom in terms of access to components, but to be honest, it's not that bad. It's certainly not as easy to wrench on as a mid-tower, but this ain't no mid-tower. In fact, compared to some traditional shoebox small form factors that we've worked on in days past, the Revolt is an improvement.

> "
> OF THE FOUR BOXES HERE, THE REVOLT WAS THE QUIETEST



The iBuypower features LEDs behind the side panels that can change color at the push of a button.

In the configuration arena, the Revolt is "well-kitted," as our cousins across the pond say, in the CPU and GPU departments. In fact, you can't get better in something this small. The GeForce GTX Titan and Core i7-4770K are the absolute fastest parts available in any micro-tower. iBuypower, however, took an interesting tack by including an NZXT 140mm liquid cooler for the CPU. This amount of cooling should allow for pretty reasonable overclocking on a Haswell, but iBuypower left its Haswell part bone-stock. Say what you will about the lack of an overclock in terms of performance, but acoustics nuts will be pleased. Of the four boxes here, the Revolt was the quietest under a full CPU load. Where the other three micros would start to howl under load—even the liquid-cooled Falcon Northwest Tiki—the Revolt was noticeably quieter. It's not silent, mind you, and we're not even sure it's the best solution for a quiet night of pretentious foreign cinema on your HDTV, but it's definitely the least noisy of the four under load.

One area where the Revolt failed to impress was in storage. iBuypower took the route used by many vendors lately: skimping. To get a PC with a Titan and top-end Haswell under $2,000 (OK, $1 under),



The insides look uninviting, but getting hands-deep into the Revolt isn't that bad.

you have to rob Bill to pay Steve. In this case, iBuypower went with a 1TB Western Digital Black drive and a 120GB Corsair Neutron GTX SSD. Pardon us, but that is so 2012 in drive capacity. Just trying to run our benchmarks we ran into space limitations fairly quickly. It's hard to believe, but 120GB of primary storage is no fun. Even the 1TB hard drive seems miserly in a day when 3TB HDDs are growing on trees.

In the all-important area of performance, we figured the iBuypower, with its Core i7-4770K, would stand a good chance against the Ivy Bridge–based Digital Storm Bolt, but the heavily clocked-up Bolt easily outpaced it. In our Stitch.Efx 2.0 test, where we task the machine with creating a massive gigapixel image from 200 images shot with a Canon EOS 7D, the Revolt was 9 percent slower than the Bolt. In ProShow Producer 5.0, it was slower than the Bolt by 8 percent. The Revolt does get some partial revenge in our Premiere Pro CS 6 workload, with its final render time just 2 percent slower than the Bolt.

The copper-colored elephant in the room is the Falcon Northwest Tiki, though. With its Haswell soaring along at 4.7GHz, the Tiki simply crushed the Revolt by double-digit margins in almost every benchmark.

In gaming tasks, the Revolt is fully capable of playing every single game out today with all settings at maximum at 1920x1080, as well as at 2560x1600 with most settings cranked up, but in this showdown, the Bolt and Tiki are still faster.

That's all fine and good, but careful observers will note the price disparity. The Revolt is $2,000. The Digital Storm Bolt hits $3,377, and the Falcon Northwest Tiki is more than twice as much at $4,433. Only the Alienware X51 R2 comes in at a lower price, but its components put it in a different class than the top three contenders. No, this is really a three-way battle between the Bolt, Revolt, and Tiki. In that respect, the Revolt certainly doesn't take home any performance trophies, but with its still-respectable speed and insanely good price, it damn well wins the prize for best deal. And for a lot of folks, that's what really matters. Double up on the storage and you've got an even more well-rounded box.

SPECIFICATIONS

CPU	3.5GHz Core i7-4770K
Motherboard	ASRock Z87E-ITX
RAM	8GB G.Skill Ripjaws DDR3/2133
GPU	GeForce GTX Titan
SSD	120GB Corsair Neutron GTX
HDD	1TB Western Digital Blue
ODD	Slot-fed DVD burner
Cooling	NZXT Kraken X40
PSU	500-watt FSP
Case	Custom
W x H x D	4.75 x 15.5 x 16 inches
Weight (lbs)	20.6
Warranty	Three years

VERDICT 9

iBuypower Revolt

$2,000, www.ibuypower.com

DIGITAL STORM BOLT

CAN A LAST-GEN CHIP KEEP THE BOLT IN CONTENTION?

Given our experience building Dream Machine every year, we know how meeting a strict deadline invariably leads to compromise. Indeed, sometimes you build a PC with the hardware you have, not the hardware you wish you had.

That's how Digital Storm might have been feeling when the Bolt was boxed up and sent in for this showdown of the fastest micro-towers on the planet. We say this because, of the four boxes that hit our Lab benches, the Bolt was the odd man out in hardware.

Rather than include the current state-of-the-art in Intel processors—the new Haswell fourth-gen parts—the Bolt is packing a Core i7-3770K chip. Yup, Ivy Bridge, my friends. This might be good news for folks in the Haswell Haters Club, but for the majority of enthusiasts who like to get the latest and greatest, well, this won't make them happy. More on this later.

The Bolt itself is little changed from the previous versions we've tested. It's the thinnest of the bunch by a hair. We're also fans of the angled pedestal. It's a pretty nice aesthetic and it doesn't have the same weight penalty as the Falcon Northwest's granite base. We've bitched in the past that we want the ability to lay the Bolt on its side for use in home media centers, and Digital Storm has since responded with a pretty clever solution. Rather than making every unit lay flat, the company now offers an optional bracket for $29 that attaches to the side. Simply unscrew the base, mount the optional bracket, and the Bolt can run on its side with adequate airflow to keep its components cool.

To get your hands dirty with the Bolt, you undo four screws in back and slide the entire cover off. That effectively gives you open access to the RAM, CPU, SSD, and PSU. Besides the Falcon Northwest Tiki, the Bolt probably ranks as having the easiest access to parts. Well, except for the GPU, of course. If you intend to pull the



The Bolt's outer shell slides off to give you easy access to its guts, and there's even a cutout in back for the motherboard.



We're big fans of the angular lines on the Bolt's case.

GPU, you'll need to do some graphics-card yoga as well as probably removing the auxiliary PSU fan and maybe even the PSU. It's not impossible, but also not a five-minute job. We should note that the Bolt is the only system here with an exposed cutout tray to access the backside of the CPU. This makes pulling the Zalman CNPS8900 Extreme air cooler an easy affair.

Speaking of the air cooler, we should also mention that under heavy CPU loads, such as video encoding, the Bolt stands out as the *loudest*. It wasn't horrible, but it was definitely noticeable. You can't blame this on the Zalman CNPS8900 Extreme alone. When it comes to overclocked CPUs, it's pretty hard to ask an air cooler to try to compete with liquid coolers. The Falcon Northwest Tiki uses a 120mm liquid cooler from Asetek and the iBuypower Revolt uses an even bigger 140mm NZXT Kraken X40 liquid cooler, and they rank accordingly in acoustic output. Under CPU chores, the iBuypower Revolt is the quietest. The Falcon Northwest Tiki has the Bolt beat, but keeping a Haswell Core i7-4770K cool and quiet at 4.7GHz is no easy task.

If the Core i7-3770K in the Bolt were stock, it might not make as much racket, but clocked up to 4.35GHz, it's going to put out some

heat. Speaking of Ivy Bridge vs. Haswell, most of you will want to know how the Ivy Bridge does here in a crowd of Haswell parts.

The Alienware X51 R2, with its 3.2GHz Core i5-4430, stands no chance. It doesn't have the clock speeds nor Hyper-Threading to compete. The Falcon Northwest Tiki at 4.7GHz—that's right, 4.7GHz—was early ruled Most Likely to Beat Everyone Bloody, before we even finished the benchmarks. No, to really represent the He-Nerd Haswell Haters Club, we turned to the iBuypower Revolt and its stock-clocked 3.5GHz Core i7-4770K. The winner between Ivy and Hassy? We're calling it for the Ivy part. It's not a complete victory, but for the most part, the Core i7-3770K comes out on top in the CPU-heavy tasks. In GPU-on-GPU action, it's mostly a tie, as it's just Titan vs. Titan there. That is, with the exception of the Tiki, which has an overclocked GPU, too.

The Digital Storm also takes second place to the Tiki in storage, but is clearly more practical and affordable. Its configuration reflects modern tastes and usage, with a 240GB Corsair Neutron GTX SSD and a 2TB WD Black drive. That's far better than the iBuypower, which uses a 120GB SSD and 1TB HDD, or the Alienware's sole 2TB hard drive configuration.

What you think of the Bolt ultimately depends on how much you really want top-of-the-line parts in your rig. We've said it before and we'll say it again: Ivy Bridge is still a really great CPU. If we had an Ivy Bridge box, we sure wouldn't spend the money to upgrade to Haswell.

But—and you knew that was coming—if we were building or buying a new box, Haswell offers the best upgrade path, an actual (albeit evolutionary) performance upgrade, and full SATA 6Gb/s across all ports. We'll admit that the latter point doesn't really matter so much in a micro-tower that will max out with two SSDs, but we think the other points are still relevant and ultimately hurt the Bolt's score, regardless of its very good performance.

VERDICT 7

Digital Storm Bolt

$3,377, www.digitalstorm.com

SPECIFICATIONS

CPU	3.4GHz Core i7-3770K @4.35GHz
Motherboard	Asus P8Z77-I Deluxe
RAM	16GB Corsair Vengeance DDR3/1866
GPU	Custom
SSD	240GB Corsair Neutron GTX
HDD	2TB Western Digital Black
ODD	Slot-fed Blu-ray combo
Cooling	CNPS8900 Extreme
PSU	500-watt Sparkle
Case	Custom
W x H x D (including base)	5.5 x 14 x 15 inches
Weight (lbs)	22.2
Warranty	Three years

STEAM BOX DIY

ACCESSORIES ARE THE KEY TO LIVING ROOM GAMING NIRVANA

We were sent on a secret mission to leave the domed city and find the fabled Steam Box—a wee PC made expressly for living room gaming. And just as Michael York learned in *Logan's Run*, there is no Steam Box. Got it? Say it again slowly: "There is no Steam Box." Instead, there are super-powerful micro-towers that easily let you make your own Steam Box. But you'll need the aid of two key accessories.

Xbox 360 Wireless Controller for Windows

Steam's Big Picture mode is designed specifically to navigate using a game controller. No matter what your console controller allegiances are, most would agree that the Xbox 360 controller is the universal standard. The good news is you can use it on your PC, too. Just buy the Xbox 360 Wireless Controller for Windows, which gives you a wireless USB dongle that plugs into your PC. With the Xbox 360 controller in place, you can run just about everything in Big Picture mode.
$40, www.microsoft.com



Logitech K400

Steam's Big Picture mode runs great with a controller, but since it's running on a PC, you'll always need a keyboard. We've tried a lot of different wireless keyboards over the years and Logitech's K400 has consistently kept us happy. It's basically a variant of the excellent keyboard that came with the failed Logitech Revue Google TV. It runs on AA batteries, so you don't have to worry about recharging it, either, and it's cheap. For HTPC/Steam Box use, it's hard to beat.
$25, www.logitech.com



FALCON NORTHWEST TIKI

THE FASTEST MICRO-TOWER TO ENTER OUR LAB

Here's a little inside OEM trivia: Falcon Northwest is one of the most competitive system builders we deal with. The company flat-out doesn't ever like to lose a showdown on performance grounds. Price? Fine. Bundle? OK. But when it comes to performance, Falcon will sacrifice almost everything to win in that category.

That's just what the company has done with the latest iteration of the Tiki, which damn near maxes out what can be done in a machine of this size.

For example, the 3.5GHz Core i7-4770K in this machine is clocked as high as in the Maingear full-tower rig with custom water cooling that we reviewed in August: 4.7GHz. Falcon does this with the aid of an Asetek 120mm cooler that magically folds into the slim chassis. Of the boxes here, only the iBuypower Revolt and Falcon Northwest Tiki pack liquid cooing. The Revolt's cooler is bigger at 140mm but its chassis is also pudgier.

Alongside the Tiki's OC'd Hassy, we also find a GeForce GTX Titan, which, true to Falcon's competitive spirit, is also overclocked.

The Tiki isn't watered-down in storage, either. You get two 240GB Crucial M500 SSDs in RAID 0 and a 3TB Western Digital Green drive. Despite its micro-tower form factor, you should be able to easily push 2TB in SSD and 4TB in HDD. Not bad for such a tiny box.

Amazingly, all this runs off of a 450-watt Silverstone PSU. This is down 50 watts from the 500-watt units in the iBuypower Revolt and Digital Storm Bolt. We're actually impressed that all three boxes buck Nvidia's mandate of a 600-watt minimum for the Titan. Will there be problems long-term? We guess not, as each vendor would have to eat the cost of replacing a bad PSU (all of them offer a three-year warranty). It's more likely that the 600-watt spec by Nvidia is based on a full-tower application, which could run multiple hard drives and a dozen fans if so desired by the builder. A micro-tower, on the other hand, is inherently limited to two SSDs, a hard drive, and a single GPU.

Getting inside the Falcon is a very straightforward, almost mid-tower-like affair. Remove two thumbscrews in back and slide off the side door. The 120mm Asetek's radiator is attached to the door and can be easily removed, if need be. With the door off, you have easy access to the GPU, RAM, and drives. One problem, though: If you need to access the back of the motherboard to futz with a cooler backplate, you'll have to pull the board, as it doesn't have the giant cut-out in back like the Digital Storm Bolt, nor can you pull off the right side of the case. As with like the Digital Storm and iBuypower boxes, getting to the GPU is work. It's not horrible, but it'll take a few minutes. Surprisingly, this makes the Alienware X51 R2 the easiest box in which to access to the GPU.

> PART OF THE PRICE IS THE PAINT JOB, WHICH COSTS $900

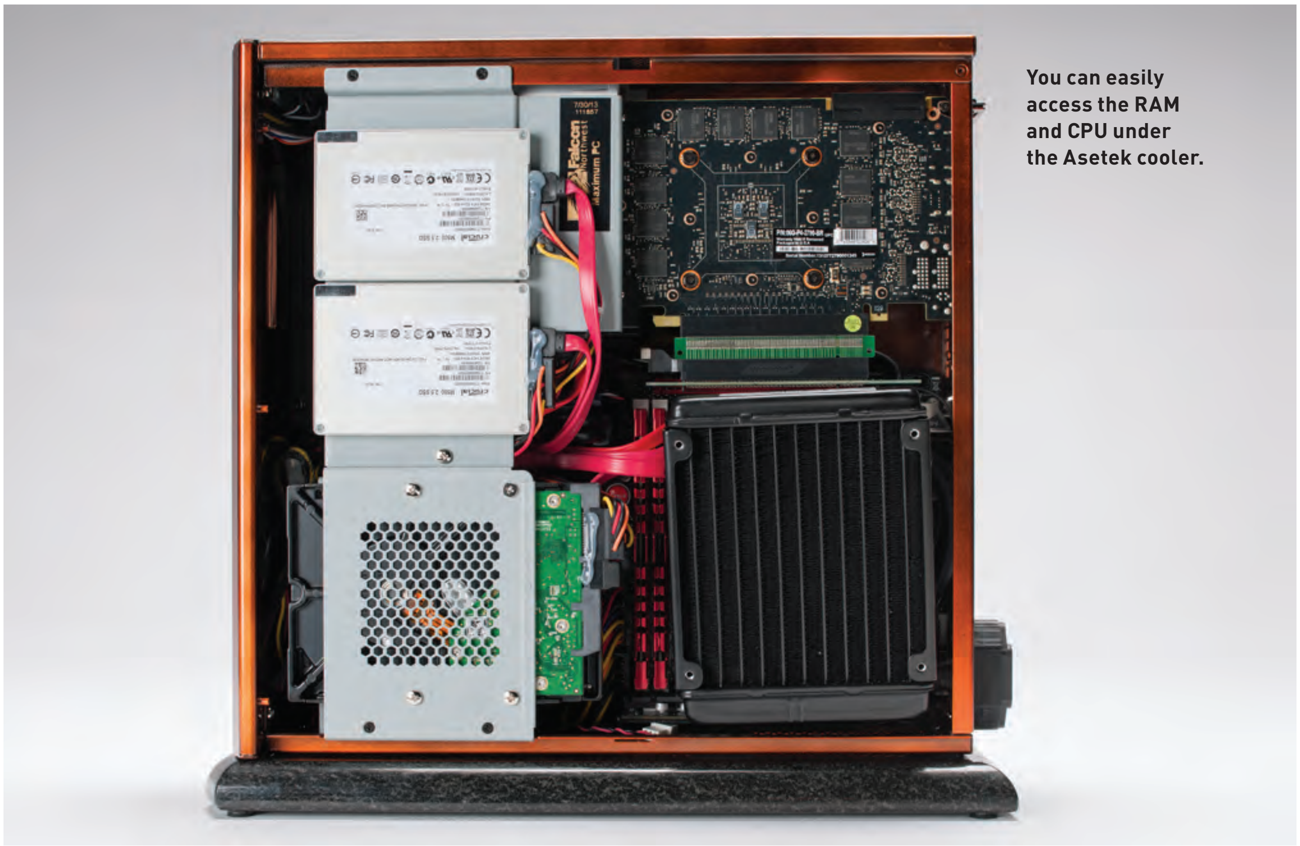


The Tiki pushes its CPU as hard as any full-tower box.

In all four units, access to the critical components really isn't bad. It's not as easy as a mid-tower or full-tower, of course, but it's actually easier than most shoebox SFF cases and systems we've wrenched on.

Externally, there's very little difference from the first Tiki we reviewed in August 2012. Well, except for the paint. Falcon had its internal case painter apply a custom copper paint job. It's certainly smooth and high-quality, but like any custom paint job, its appeal is subjective (kind of like a beige Dream Machine, right?). In the Tiki's case, most of the editors on staff found it to be garish, but as it's custom at the time of order, you could specify a more subdued shade.

The granite base was also a source of debate among staffers. We'll admit that the aesthetic isn't for everyone, but we've come around on its utility. Falcon Northwest has always said the heavy granite base helps prevent the system from getting knocked over. Most of us scoffed at that likelihood, but after taking the Alienware X51 R2 to a small LAN party and seeing how tippy a 3–4-inch-wide system can be when placed on a folding plastic table, we're more



You can easily access the RAM and CPU under the Asetek cooler.

convinced of the granite's usefulness. The Falcon Northwest Tiki isn't tipping over unless you shove it. We have to point out, though, that with the Alienware X51 R2, we could just lay the box flat on an unstable surface. The Tiki has no such option for that orientation.

In performance, it was no surprise that the Tiki cleaned everyone's clocks. With its Core i7-4770K at 4.7GHz and its overclocked Titan, it made quick work of all three of its challengers. And we don't mean by margin-of-error spreads, either. The Falcon Northwest is large—er, small—and in charge. From CPU-centric tasks to gaming, the Falcon had an edge over the others. Against its old foe and nemesis, Alienware's X51 R2, the Falcon Northwest Tiki was nearly twice as fast in almost all of the benchmarks. If it took almost 4,000 seconds for the X51 R2 to encode a video, it took half that time for the Falcon Northwest Tiki.

There is a cost to all this performance, though. The Tiki under heavy CPU duress can get loud. Fortunately, it's not the shrill fan noise or never-ending whir that plagued machines of five years ago, but loud nonetheless. Acoustically, it was slightly louder than the Alienware (which also gets loud when its CPU is pushed hard) but quieter than the Digital Storm Bolt. At idle, the Falcon Northwest Tiki was as quiet as an agnostic mouse having an existential moment, but render a video hitting all eight threads of the chip for 25 minutes and it'll get noticeable. The GPU, for its part, is better-behaved even under heavy load.

The only other dig we have against the Tiki is its price. The system comes in at $4,443, which is more than twice as much as the iBuypower Revolt and more than three times the price of the Alienware X51 R2. Part of the price is the paint job, which costs $900 itself. Even with that removed, it's still a lot of cabbage at $3,500, but it does have far more storage onboard than the others here.

As we said, Falcon doesn't care if it doesn't win the love of accountants; it just wants to prove that it can make the fastest computers around. With this Tiki, the company accomplishes that. There's no doubt which machine here is the fastest, or the most expensive.

SPECIFICATIONS

CPU	3.5GHz Core i7-4770K @4.7GHz
Motherboard	Asus Maximus VI Impact
RAM	16GB G.Skill Ripjaws DDR3/1866
GPU	GeForce GTX Titan
SSD	Two 240GB Crucial M500 in RAID 0
HDD	3TB Western Digital Green
ODD	Slot-fed Panasonic UJ-265 Blu-ray burner
Cooling	Asetek 550LC
PSU	450-watt Silverstone ST-45SF
Case	Custom
W x H x D (including base)	5 x 14 x 15 inches
Weight (lbs)	23.9
Warranty	Three years

VERDICT 9 KICK ASS!

Falcon Northwest Tiki

$4,433, www.falcon-nw.com

ALIENWARE X51 R2

DOESN'T ADVANCE FAR ENOUGH FORWARD

Alienware kicked off the micro-tower revolution with its original X51. Prior to that, most performance-oriented small-form-factor boxes used Mini-ITX motherboards in shoebox-shaped chassis.

The X51 was different. Starting with the same basic shell and shape as a business-class small form factor, Alienware set out to address the business box's major weakness: graphics. Most PCs of that size use either integrated graphics or low-TDP, half-height GPUs with minimal chutzpah.

Alienware changed the game by making these thin form factors capable of, well, gaming, by squeezing in full-size GPUs. The rest, as they say, is history, and the three other followers here show the strength of the design, with more competitors likely on the way. What can we say? People want big desktop gaming performance but in a box small enough to be confused with a game console.

So, without a doubt, Alienware deserves credit for moving the ball forward on small, fast PC performance. But does Alienware/Dell keep the forward momentum going with the R2 version of the X51? Unfortunately, no. More on that in a bit.

Getting into the X51 is pretty simple. Undo one screw and slide off a side panel to access the GPU and CPU. RAM is also there, tucked in under the air intake for the CPU. If you look at a picture of the X51, you might think replacing or upgrading the GPU would be a serious pain in the butt, but it isn't. Remove two screws holding the GPU in place and then carefully lift out the card. In fact, a GPU swap is actually easier here than with the three other boxes, despite its intimidating looks. Getting at the unit's sole hard drive—a 2TB 7,200rpm Seagate Barracuda, in our case—is done with the GPU lifted out. Again, it's really not daunting—we know because we've done it several times with the original X51.

And that, sadly, is our problem. Despite the R2 moniker, the X51 R2 is largely the same as the original, and carries the same shortcomings, too. The primary shortcoming is its storage subsystem. The Seagate 2TB 7,200rpm Barracuda is a fine drive but it ain't no SSD, and booting and other disk I/O–intensive tasks are simply painful. While the three others here boast the optimal setup of SSD-plus-HDD, the Alienware is stuck with a hard drive as its only option. The only way to add an SSD would be to buy a 2.5-inch-to-3.5-inch bay adapter and jettison the hard drive.



Getting into X51 is actually very easy despite the daunting looks of the guts.



We checked with our resident Macsexual and he said the Alienware was the coolest-looking of the four.

The other limitation is in power. The three other rigs here pack 450-watt or 500-watt PSUs, which is apparently enough, believe it or not, to run a GeForce GTX Titan card. When Alienware designed the X51, it moved from an inboard PSU used in most business small form factors to an external power brick. It's a hefty brick and it puts out 330 watts. That's not bad, but it's not enough to run much more than the GeForce GTX 670 in the box. Now, let's be fair to the GeForce GTX 670; it's still a great card and, frankly, should play the vast majority of today's and tomorrow's games at 1080p resolution with a few knobs turned down a bit, but it's getting to be a bit elderly.

In the processor department, the Alienware X51 packs a Has-

well Intel Core i5-4430 quad-core part without Hyper-Threading. It's got a 3GHz base clock with a Turbo Boost of 200MHz. As it's not a K part, overclocking isn't possible. Period. In performance, as you can imagine, the Alienware X51 R2 doesn't take home any trophies. We're not even sure it gets the consolation prize, a certificate created in Broderbund Print Shop 3.0 and spit out on a dot-matrix printer five minutes before the game was over. For example, the Falcon Northwest Tiki is damn near 100 percent faster than the Alienware X51 R2 in *everything*. And we mean *everything*. From gaming chores to CPU tasks, the Falcon laps the Alienware X51 R2 almost every single time. It's not much better against the iBuypower Revolt or Digital Storm Bolt, either.

Before you start saying that it's just our opinion, man, we'll acknowledge that the Alienware X51 R2 sets the bar in pricing. The box as configured tips the credit card at $1,350, which makes it the most affordable micro-tower in this roundup. In real-world use, the Alienware X51 R2 will fill the needs of 75 percent of gamers, too. In fact, we took the Alienware X51 R2 to a small LAN party and for gaming at 1080p it performed admirably and got a lot of admiring looks, to boot.

But we have to say, at $1,350 you might think you're getting a lot of value, until you eye the iBuypower Revolt. Sure, the Revolt is $1,999 but you're getting a GeForce GTX Titan, an SSD, and a Core i7-4770K with liquid cooling and overclocking capability. If we had to pick a machine that gives you the most bang for the buck, we'd pass over the Alienware X51 R2 and go straight to the iBuypower Revolt, which really packs in the value.

To close this off, we have to again remind people that Alienware kicked off this wave of micro-towers, and we have no doubt there will be an X51 R3 in the future. We just really hope the R3 carries the ability to mount an SSD as well as a hard drive and the ability to run the top-end GPUs. It's a worthy box, but it falls short against the competition.

VERDICT 7

Alienware X51 R2

$1,350, www.alienware.com

SPECIFICATIONS

CPU	3.2GHz Core i5-4430
Motherboard	Custom
RAM	8GB DDR3/1600
GPU	GeForce GTX 670
SSD	None
HDD	2TB Seagate Barracuda
ODD	Slot-fed Blu-ray combo drive
Cooling	Air cooling
PSU	330 external power brick
Case	Custom
W x H x D (including base)	3.75 x 14.7 x 12.75 inches
Weight (lbs)	15.2
Warranty	One year

THE OG MICRO-TOWER

REMEMBERING THE HP FIREBIRD 803

We largely credit Alienware's X51 with spawning the current micro-tower revolution but we'd be remiss if we didn't mention Hewlett-Packard's contribution back in 2008 with the Firebird 803. The Firebird 803 was a scaled-down version of the honking-huge Blackbird 002 and was comparable in size to today's micro-towers.

So, why did the Firebird 803 fail? There are probably a lot of reasons, but for us the main problem was a lack of industry-standard parts. At a time when tower PCs all used off-the-shelf parts, the Firebird 803's mix of laptop and desktop parts was off-putting. It sported a liquid-cooled Core 2 Quad on a proprietary motherboard using an nForce 760S chip, it used SO-DIMMs, and graphics were handled by two mobile GeForce 9800S parts in SLI.

Among the Firebird's missteps: no PCIe slot for any potential to upgrade. It was essentially a big laptop on a stand with liquid cooling. So, technically, it's actually fair to give the Alienware X51 full credit for inventing the micro-tower. It isn't just the size, it's also the use of an industry-standard discrete GPU.

We couldn't recommend the Firebird back in its day and we probably wouldn't today, either, but looking back on our review it's interesting to note what we wrote: "Beyond just the Mad Max world we're hurtling toward where everyone has to knife-fight for a liter of gasoline, this could very well be the future of high-end computing. PCs have grown smaller over the years and add-in cards fewer. With external graphics on the way, it's quite possible the Firebird is a precursor of what an enthusiast PC will look like in 2013."



MICRO-TOWERS UNDER THE MICROSCOPE

ITHE BENCHMARKS SHOW US WHAT THESE MIGHTY MITES ARE REALLY MADE OF

In selecting benchmarks for the four micro-towers in this roundup, we decided to reach outside our standard suite of system tests. These machines, after all, seem primarily aimed at gamers, so in addition to our standard CPU-centric benchmarks, we also ran the rigs through off-the-shelf games as well as the new 3DMark and the popular Unigine 4.0 benchmark. As the boxes are limited to single GPUs, we also decided that in addition to 2560x1600 testing, we'd see how these machines run at the far more realistic resolution of 1920x1080.

If you've read the reviews or just peeped the specs of each individual box, it should be no surprise that the Falcon Northwest Tiki easily took first place at anything that's performance related. Its heavily overclocked Core i7-4770 Haswell chip handily sprinted past the stock-clocked iBuypower Revolt and even the clocked-up Digital Storm Bolt with its Ivy Bridge Core i7-3770K. Let the naysayers continue their hating on Haswell, but there's no doubt here that Ivy Bridge is at disadvantage against Intel's newcomer.

The Tiki didn't just win the CPU tests, either; its overclocked GeForce GTX Titan also gave this rig a noticeable performance advantage in gaming at both 1920x1080 and 2560x1600. So let's just declare this roundup done and over: The Falcon Tiki is clearly faster in every performance category we evaluated. Again, if you didn't get the memo: It's the fastest micro-tower we've ever tested. It's also the most luxuriously outfitted, with its RAID 0 SSDs and 3TB HDD.

But who gets the silver medal in this contest? That's a far tougher call. The Digital Storm Bolt actually has a slight edge over the iBuypower Revolt and is technically second place in performance. You can thank its 4.35GHz Core i7-3770K for that. The Bolt also has the most reasonable storage subsystem, whereas iBuypower decided to kick drive capacity out the door in pursuit of a lower cost. Lower cost is not something to be trifled with, though. The Digital Storm Bolt is almost $1,400 more than the iBuypower—yes, it's faster, but just by a smidgen. And in the very important acoustics category, the liquid-cooled and stock-clocked iBuypower Revolt is the clear winner. The machine simply doesn't get loud the way the three others do. So, taking into account cost and noise and very close performance scores, we're putting the iBuypower Revolt in second place overall. But it takes the first-place prize for bang-for-the-buck. We originally thought that honor would go to the $1,350 Alienware X51 R2, but the iBuypower at $2,000 gives you so much more that we think it's a much better value.

That leaves the Alienware X51 R2 in last place. Some of you probably saw that coming. The fact is, you can buy three Alienwares for the price of one Falcon, so is it even a fair contest? While its size definitely puts it into the same class, Alienware needs to step up with the third generation of the X51 to make it a bit more competitive with the newcomers, because the other three boxes here certainly won't be the last to emulate the X51's form factor.

BENCHMARKS

	Falcon Northwest Tiki	Digital Storm Bolt	iBuypower Revolt	Alienware X51 R2
Premiere Pro CS6 (sec)	**2,100**	2,538	2,601	3,915
Stitch.Efx 2.0 (sec)	**693**	770	842	1,122
ProShow Producer 5.0 (sec)	**1,176**	1,323	1,432	1,759
X264 HD 5.0 pass 1 (fps)	**95.2**	84.6	81.4	48.2
X264 HD 5.0 pass 2 (fps)	**20.3**	17.2	16.4	11.54
Metro Lastlight 25x16 (fps)	**27.8**	24.7	24.4	15.0
Metro Lastlight 19x10 (fps)	**48.5**	41.8	42.5	27
Hitman Absolution Ultra 25x16 (fps)	**44.9**	41.8	42.1	25.9
Hitman Absolution Ultra 19x10 (fps)	**70.3**	62.9	63.9	41.7
Tomb Raider 25x60 (fps)	**52.7**	44.7	43.8	18.3
Tomb Raider 19x10 (fps)	**83.3**	70.1	69.9	43.2
3DMark 11 Overall	**X5,417**	X4,944	X4,931	X2,285
3DMark Firestrike Extreme (score)	**5,206**	4,645	4,715	2,652
3DMark Firestrike Extreme (graphics)	**5,402**	4,770	4,925	2,800
3DMark Firestrike Extreme (physics)	**12,975**	11,719	10,577	5,992
Unigine 4.0 25x60 (fps)	**40.9**	34.2	35.3	20.0
Unigine 4.0 19x10 (fps)	**71.0**	58.5	58.6	35.5

Best scores are bolded.

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PC VS. NEXT-GEN CONSOLE: FIGHT!

A FANTASY BATTLE FOR DOMINION OVER THE LIVING ROOM



Xbox One

Nerds wonder openly what would happen if the Enterprise fought an Imperial Star Destroyer, or who would win in a battle between Superman and Wolverine, so don't get all apples-to-pears on us, man, if we want to see how the average micro-tower would stack up against the incoming next-gen consoles.

Since the Xbox One and PlayStation 4 aren't out yet, we had to scour the Internet for details about the hardware inside. Not all of the specs are set in concrete, so they could change, but this close to launch, we think we have a pretty good idea about what the two new consoles will be offering. To represent the PC, we went with the bang-for-the-buck winner, iBuypower's Revolt.

CPU PERFORMANCE

Both Microsoft and Sony showing up with eight-core, AMD Jaguar x86 processors running at around 1.6GHz must be like two bitter high-school frenemies showing up to prom with the same dress. The Jaguar core itself is an improved Bobcat core, which has been used in the Brazos APUs. In a nutshell, they're low-power, out-of-order, x86-64 processing cores. For what they are, they're not bad. But in actual x86 performance, even with eight cores, they don't compare to the Core i7-4770K. That Haswell chip in the iBuypower Revolt would very likely eat an Xbox One or PlayStation 4 alive and then floss its teeth with the console's power cord. The good news for the console crowd is that the CPU doesn't do that much of the heavy lifting anymore. Even better, since developers highly optimize for consoles, audio processing, OS management, and other mundane tasks will likely be fine, since the performance envelope is well known on both consoles. But make no mistake, there's no question as to what is more powerful in x86 performance.

Winner: PC



PlayStation 4

GRAPHICS PERFORMANCE

Graphics performance on the Xbox One and PlayStation 4 is a hotly debated topic that's been burning up the Internet. From the limited information we have, the PS4 has the lead in pure graphics grunt. Its shader performance of 1.84TFLOPs is quite a bit higher than the Xbox One's 1.23TFLOPS. In fact, so much has been said of the graphics disparity between the PS4 and Xbox One that Microsoft officials recently announced that the Xbox's GPU clocks have been goosed from 800MHz all the way to 853MHz (yawn)—regardless, that still leaves the PS4 the leader. Oh, right, but what about the PC? That Titan has compute performance of 4.5TFLOPs, so figure it out.

Winner: PC

MEMORY

The PS4's 8GB of GDDR5 and 176GB/s of bandwidth had even us whistling. Especially when you consider the Xbox's bandwidth is down at 68GB/s. The good news for the Xbox is that it has 32MB of embedded SRAM that looks to offer from 102GB/s to 192GB/s of memory bandwidth to help ameliorate its relatively low system and graphics bandwidth. What about the PC? Isn't its system bandwidth pretty low at a theoretical 34GB/s? Yes, but for system chores it's fine. Gaming PCs almost all use discrete graphics, so it's really the GeForce GTX Titan's bandwidth we need to break out the ruler for. In that case, it's 6GB of GDDR5 on a 384-bit interface for roughly 288GB/s of graphics bandwidth.

Winner: PC

PRICE

Yeah, you knew this was coming. The Xbox is $500, and the PS4 is $400. The iBuypower Revolt is $2,000. Winner: Console? That depends. If we were talking purely gaming, perhaps. But the magic of the PC is that it's a multipurpose tool. Yes, it's the absolute best gaming platform but it's also used for running Microsoft Office, editing photos, encoding videos, compiling applications, and is a limitless platform for exploring the Internet, too. So what exactly is the better value here? If you were holed up in your dorm or apartment due to a zombie apocalypse, would you rather have a PC or next-gen console? Yeah, we'd take the PC, too.

Winner: PC

BY DAVID MURPHY

CLOUDY WITH A CHANCE OF STORAGE

15 ONLINE STORAGE SERVICES COMPARED

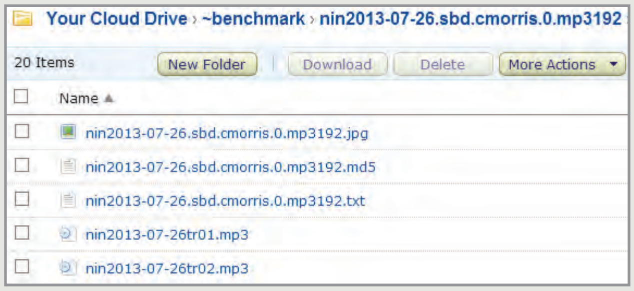
The convenience of cloud storage is undeniable: your data and media at your fingertips from any Internet-connected device—what's not to like? And there's certainly no shortage of options to choose from, most of which are totally free up to a certain capacity. The trick is deciding which cloud service to use. After all, there are notable differences between them. Some are ideal for security mavens who want to preserve their anonymity (and the anonymity of their data). Others are better for folks just looking for a massive dumping ground for a ton of data. And still others are geared toward those keen on sharing all sorts of files with their friends and colleagues. In this roundup, we'll break it all down for you and identify the strongest cloud storage services. We'll also show you how to encrypt files that you store online and how to combine multiple cloud-storage accounts into one unified pot.

AMAZON CLOUD DRIVE

THE FREE ITERATION of Amazon's Cloud Drive nets you 5GB total of space to work with, but there's a bit of a catch: Don't go expecting to upload huge files to the service, as you're capped to a maximum of 2GB per file. If you need more overall storage, you'll be ponying up in various increments up to and including $10 a year for 20GB of space, $50 a year for 100GB, and a whopping $500 a year for a full terabyte of cloud storage (oof!).

On our benchmark—a 132MB transfer of 24 total files—Amazon clocked in at 3:15 (min:sec). That's not the speediest of upload times among all the cloud services we tested; worse, the files you upload to Amazon don't appear to be encrypted once they hit the server.

Amazon Cloud Drive operates as a simple downloadable app for your PC that syncs a folder's worth of files to your online storage, in addition to a web-based tool for managing your files in the cloud. The latter comes with a ho-hum player that lets you view your pics, listen to your tunes, or watch your movies—it ain't pretty, but it works. Annoyingly, Amazon only lets you share a single file at a time with friends via pre-generated URLs.
www.amazon.com



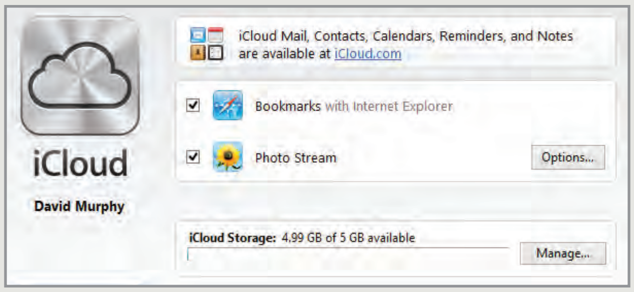
Amazon's Cloud Drive presents a pleasing list of your files in its online app, though we wish it was more integrated with the company's other cloud storage offerings.

APPLE ICLOUD

YES, APPLE'S iCloud is technically a cloud storage service—and then some, once you factor in the service's ability to synchronize your contacts, calendars, notes, and more across your various iOS-friendly devices.

However, if you're using a PC—and just a PC—then you really have no need whatsoever to install Apple's meager iCloud app. You can only really sync files from your iOS devices' Photo Streams to your PC (or, conversely, photos from a specified PC folder to your iPad or iPhone). Otherwise, it's not like Apple's giving you a folder for dumping files into that will somehow synchronize with other PCs you've installed the iCloud app onto.

If you do own multiple Apple devices, iCloud's feature set (and device integration) is pretty awesome in most ways, save for its price—beyond the 5GB you get for free, there is a yearly fee of $20 for an extra 10GB of storage, $40 for 20GB, or $100 for 50GB. To Apple's credit, the company doesn't count iTunes movies and music purchases against your total storage quota. And the core offerings—mail, contacts, calendar, and notes synchronization—should hardly chip away at your free 5GB. Additionally, Apple stores your information using 128-bit AES encryption at minimum.
www.apple.com



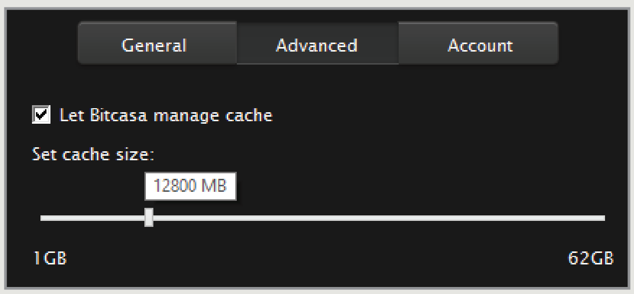
You can't really do much with iCloud if you're not an Apple aficionado.

BITCASA

THIS DESKTOP- and web-based cloud service delivers a pretty hefty amount of free storage—10GB—in addition to everyone's favorite caveat: no restrictions whatsoever on the file sizes you want to throw into your online pool. And if you need more room, Bitcasa offers a single, awesome option for supplementing your pool: $99 per year for unlimited capacity.

Bitcasa dumps an "Infinite Drive" onto your system as a new drive letter. Whatever you toss in heads up to the cloud but, unlike Bitcasa's peers, the files aren't automatically mirrored on your local hard drive. A built-in caching mechanism ensures that you still have access to your most-used files when you're offline, and you can adjust just how big your cache is via the app. As for the app's performance, it took us a mere 19 seconds to send 132MB of files on up—a killer transfer time.

You *can* mirror folders on your hard drive if you want more standard cloud-sync functionality, and your data always remains protected on Bitcasa's servers with 256-bit AES encryption. Sharing your files is as easy as viewing them; you can watch movies, listen to music, or view your stored pictures using Bitcasa's web interface.
www.bitcasa.com



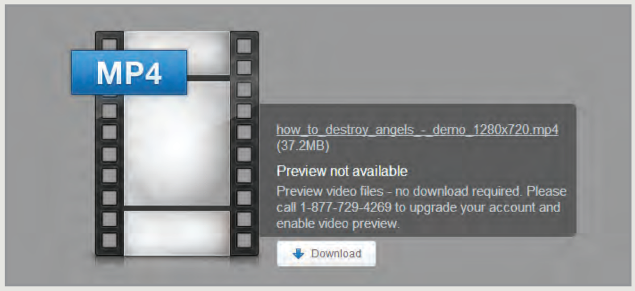
Bitcasa's cache is a critical part of its offline functionality, and we're glad for it!

BOX

TEN FREE GIGABYTES of storage await those who sign up for the free version of Box. However, you're limited to storing files no larger than 250MB each on the service—practically a sneeze in the cloud-storage world. Adding more oomph to your online offering incurs a monthly fee of $9.99 for 100GB on a personal account or, if you sign up for a "Starter" small business plan, $5 per user for pooled storage of 100GB in total. Doing so bumps you up to a file size limit of 2GB per.

Box offers four different apps for getting your PC to play with its cloud storage; it seems a bit overkill to have users piecemeal together the functionality they prefer. We couldn't get the "Box for Office" app to play with our copy of Office 2013, and the standard, folder-synchronizing "Box Sync" app took 3:51 on our transfer test—that's quite lengthy for a single app.

There's no way to view media files you send to Box via its web interface; the service is designed for adding, editing, and sharing documents and text. To that end, we do enjoy how the "Box Edit" app allows you to start new files and edit them using the office apps on your local desktop, before they're automatically saved up to the cloud when you're done.
www.box.com



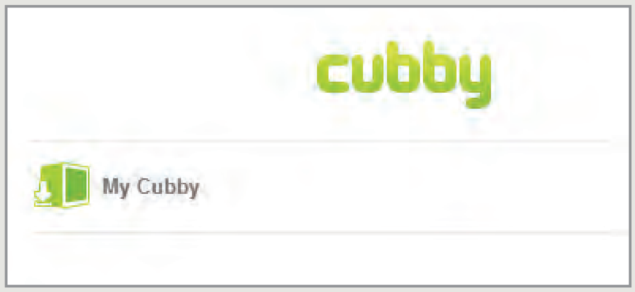
For some inexplicable reason, Box has decided to make simple media streaming a paid-for, add-on service.

CUBBY

THIS NO-NONSENSE cloud app—desktop and web—offers up 5GB of free storage with a single file-size limit of 2GB. Adding more storage will set you back anywhere from $3.99 per month for 100GB to $39.90 per month for a full terabyte, but Cubby demands that you buy a year's worth of capacity up front. (In other words, you're locked in.)

To sync your files with the cloud, you can drag them into a new "My Cubby" folder the app creates, or you can right-click existing folders within your drive's hierarchy to add them to the synchronization list—a pleasant feature for those who don't want to move data around. Cubby protects your files with AES 256-bit encryption on its end, but the speeds of the synchronization leave a little to be desired. The service clocked in at 3:46 to shoot our 132MB batch of test files up into the cloud.

Sharing your stored files with others is as easy as sending a provided link to files or a folder to your friends. Cubby also incorporates media playback and version tracking into its web app, automatically deleting old versions of your files as you start to fill up space.
www.cubby.com



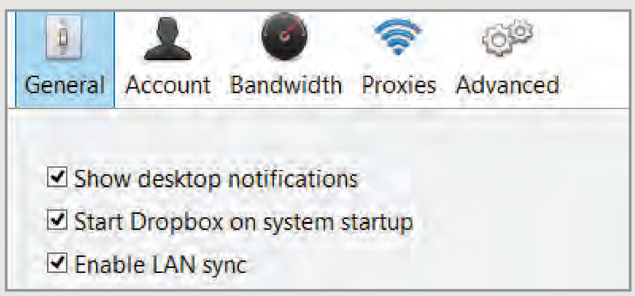
Cubby is simple, quick, and easy to use, and you don't even have to change up your existing folder structure if you don't want to.

DROPBOX

DROPBOX GIVES you a total of 2GB to start with; additional storage can be had for a not-so-insignificant $99 per year for 100GB, $199 per year for 200GB, or $499 per year for 500GB. Adding version-tracking to your Dropbox tacks on another $39 annually.

Dropbox stashes a single, simple folder onto your hard drive (which you can change, if you prefer). Anything you throw into this folder gets synchronized into the cloud and protected with AES 256-bit encryption. You can modify how much bandwidth you want the app to eat up when it's uploading and downloading, and even "selectively sync" certain folders on certain computers. An added "LAN sync" feature speeds up the process by copying files from your other Dropbox-friendly, networked systems instead of pulling them from the cloud—although it only took Dropbox a mere 7 seconds to sync up our 132MB file test.

Sharing folders and files with others is as easy as copying a link that Dropbox provides, but your friends will have to have Dropbox accounts if you want to collaborate within a single folder that's shared among all. The Dropbox web app seamlessly lets you view your photos, rock out to your music, and watch your movies directly in your browser.
www.dropbox.com



LAN sync has saved us so much file-syncing time on our home network, it's almost impossible to measure.

MEDIAFIRE

THE DESKTOP app for MediaFire is a bit worthless. Its primary purpose is to provide you with a means for copying files—one at a time—to the service's online cloud storage. Even then, MediaFire is fussy: At one point, we thought we were deleting and uploading fresh sets of files, but the service was instead keeping triplicate copies of our benchmark test. The only redeeming quality of MediaFire's boring desktop app is how it lets you take screenshots of your PC and upload them directly to your cloud storage, but that doesn't appeal to most people.

Our test file transfer took a whopping 8:40 to jump up to the cloud. Manipulating these files via MediaFire's web interface felt sluggish, and the online storage itself is a bit slow to refresh with newly uploaded files. A built-in media player lets you listen to music and watch videos, but shrinks the latter down to a fixed size—so much for our 720p video.



We're not exactly sure why a cloud storage app needs a semi-comprehensive screenshot feature, but it's there nevertheless!

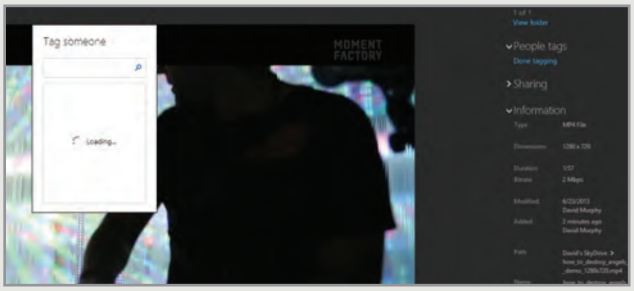
MediaFire does offer a generous free capacity of 10GB, but restricts your uploads to 200MB per file unless you pony up for a paid version of the service (starting at $49.99 annually for 100GB of storage). **www.mediafire.com**

MICROSOFT SKYDRIVE

AH, SKYDRIVE. If you're using Windows 8, you'll probably have noticed that access to the SkyDrive cloud is baked into the OS by default. It's also a downloadable app for the more traditional "sync files in a folder to the cloud" kind of access—which we greatly prefer.

The free iteration of SkyDrive gives you 7GB to play with, but your files are limited to a maximum size of 2GB each. Bumping up your storage costs $10 a year for 20GB, $25 for 50GB, or $50 for 100GB. There's no additional encryption for anything you slap into SkyDrive, and there's certainly not a great deal of speed for files synchronized via the desktop app. Our 132MB transfer test clocked in at 3:56.

We do, however, love SkyDrive's "Fetch" feature—if you set up the desktop app correctly, you can actually tap into your computer from afar and access any file on any drive within your system. It's a crazy-convenient way to access files without having to



SkyDrive's online media player (no audio!) is one of the best we've seen of the major cloud service providers; you can even tag your friends.

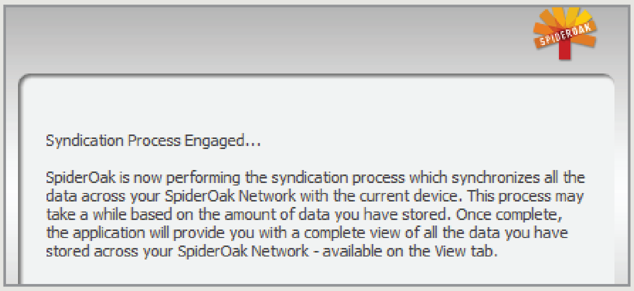
put them into SkyDrive in the first place, and you can stream videos or view pictures from the SkyDrive web app itself. (No audio files, though; sorry!) **www.skydrive.com**

SPIDEROAK

WE WISH WE had more to report about this allegedly super-secure cloud storage app. However, it's so secure, that it didn't let us into the cloud service no matter how much we tried to run through the fairly simple-seeming account setup process.

The major boon to SpiderOak is that it's designed as a "zero-knowledge system." The company has no idea what you share to the service; a benefit to user anonymity unless you forget your password, forever locking your ability to access the ultra-secret data you've stored.

Part of the process involved with generating encryption keys for SpiderOak is that you must run the associated desktop app before you can access your cloud storage for the first time. Try as we might—and we let it run overnight, even—our app just sat at the third step of SpiderOak's setup process. That's supposed to be the part where the app



Our computer spent countless hours on this screen, taunting us with the promise that we'd be able to use SpiderOak someday.

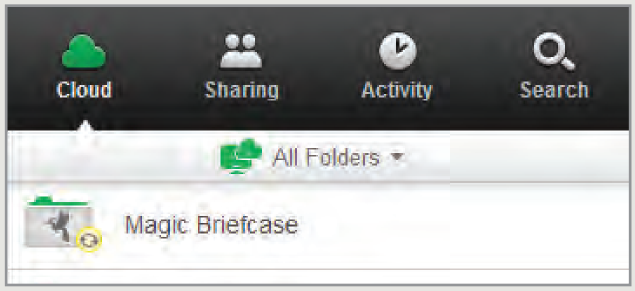
downloads your account information from SpiderOak's servers; in our setup, it was the Achilles' heel that turned our feeble attempt at accessing cloud storage into a bit of rain. Don't waste your time with this one. **www.spideroak.com**

SUGARSYNC

THE FREE ITERATION of SugarSync is a little bit buried on the cloud service's website, but signing up nets you five free gigabytes of storage with no limit to the size of files you can place within your online cloud. Additional storage isn't cheap: $74 per year for 60GB, $99 for 100GB, $249 for 250GB, or $399 (!) for 500GB.

Installing the desktop app slaps a new "SugarSync Drive" into Windows Explorer, with three folders to play with: Magic Briefcase, Mobile Photos, and Web Archive. The first is your general, speedy dumping ground—it took all of seven seconds for SugarSync to upload our 132MB batch of test files. The second is where mobile pictures you take will end up if you enable AutoSync. The third is a cloud-only directory whose contents don't eat up actual space on your hard drive.

SugarSync's web app holds up to five versions of the files you've synchronized into the cloud. Sharing and downloading zipped copies of your folders is super easy; viewing videos or listening to music is not, as SugarSync doesn't come with a web-based player for your media. All of your files are, however, protected with 256-bit AES encryption within SugarSync itself.
www.sugarsync.com



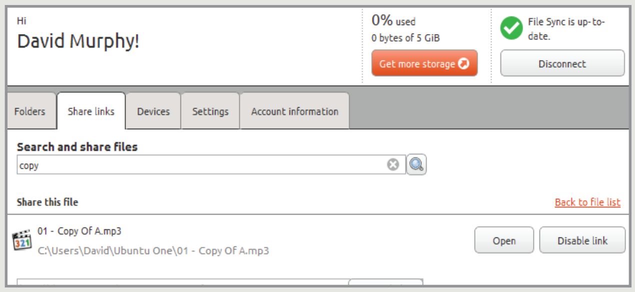
We appreciate SugarSync's hybrid approach— synchronization *and* cloud-only storage.

UBUNTU ONE

YES, EVEN the Linux folk have their own cloud service. Technically, you do as well, given that it's accessible via a downloadable PC app or web-based interface. Developer Canonical grants users 5GB of free storage, with a 5TB limit on the size of individual files you can upload to Ubuntu One. Additional storage costs $29 per year for every 20GB you want to add to your cloud; tapping into the service's music-steaming companion app tacks a $4 monthly cost onto the bill.

Canonical might want to work on the speeds of Ubuntu One's desktop app. At about nine minutes into a simple 2.1MB file transfer—yes, that little—we decided to give up, lest our full benchmark test start to rival *24 Hours of Le Mans*. What good is a cloud service that takes so long to handle simple file uploads?

Selecting new folders to synchronize to the cloud, as well as sharing them, is just a few mouse clicks away within Ubuntu One's intuitive desktop app. Even if you get your media files uploaded before the next millennium, however, know that Ubuntu One comes with no way to watch movies or listen to music via its web interface. U-bummer.
www.one.ubuntu.com



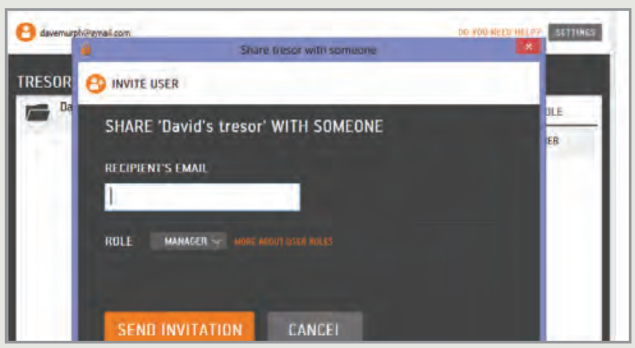
Sharing files via Ubuntu One is a pain-free process; uploading them, not so much.

TRESORIT

DON'T GET confused; a "tresor" in Tresorit terminology simply refers to a cloud-synchronized folder. The service's handy downloadable app helps you create new "tresors" and convert existing folders on your hard drives *to* "tresors," which you can then share with others by tossing an email their way via the app itself.

Unless they also install Tresorit, however, they can't access what you've sent them. Tresorit works decently as a single-user cloud backup system, although it's a bit on the slow side—it took 4:09 for our test files to transfer over, and the Tresorit app doesn't give you any status indication at all as to how many files you have left to upload or even the speed at which they're zooming along.

There's also no web-based version of Tresorit for you to use to tap into your cloud storage. While you get 5GB to play around with, you're limited by a 1.5GB file size cap *and*, er, your 5GB total—as we go to press, Tresorit is still working on offering storage expansions for its users.
www.tresorit.com



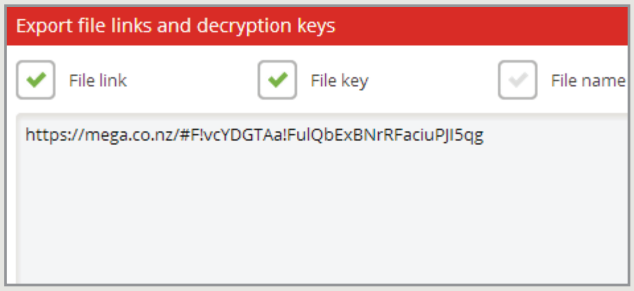
Unfortunately, only Tresorit users can be granted access to your files, limiting the app's overall potential.

MEGA

LIKE MEDIAFIRE, Mega is just an online dumping ground for your files; it doesn't even offer a downloadable app to make it easier. However, Mega is the Fort Knox of file uploaders, using AES 128-bit encryption alongside 2048-bit RSA keys to maintain the anonymity of files both stored on and shared via the service. (Just don't lose your password, or you're stuck.)

A free sign-up gets you 50GB of space with absolutely no restrictions on the size of files you'd like to upload to the service. Adding more space costs annual fees—and it's in Euros: €99 for 500GB, €199 for 2TB, and €299 for a whopping 4TB of storage. Transferring files to fill your massive amounts of space might take a bit of time, however. Mega took 4:02 to upload 132MB. If you want, you can set a speed limit for your uploads to conserve bandwidth, and you can even have Mega skip files in a batch if you've previously uploaded them, to save a bit of time.

Sharing files is as easy as right-clicking a file or folder, selecting Get Link, and sending along the encrypted link to anyone who needs your files. You can also just send the link sans encrypted key, if you want to post something public and have certain people contact you for the final bit they need to access the file.
www.mega.co.nz



Even Mega's sharing aspect is driven by its hyper-awareness toward security; we approve.

ENCRYPT THYSELF: BEEF UP YOUR FILE SECURITY WITH BOXCRYPTOR

SURE, A NUMBER of cloud-storage providers offer powerful encryption on their end—designed to give you a little peace of mind by preventing the very providers hosting your files from knowing their exact contents. But is that really the case? Dropbox, for example, says it offers 256-bit encryption, but it's highly unlikely the service encrypts your files locally before passing on the indeterminate 0s and 1s to its servers.

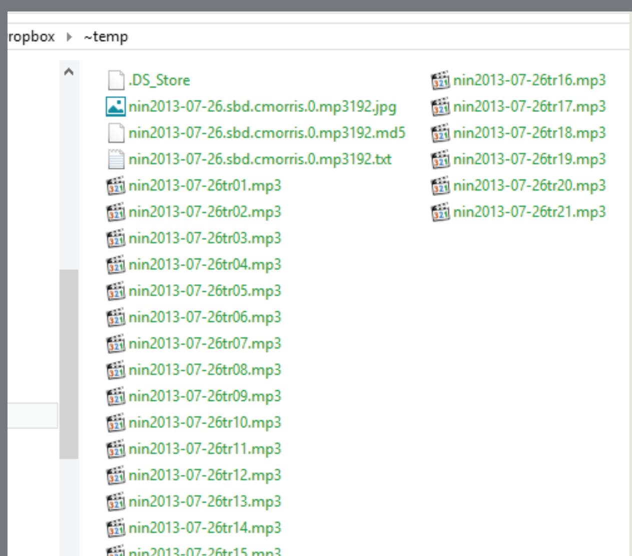
In other words, what good is encryption if a cloud storage provider knows the key? That's where a free app like Boxcryptor (www.boxcryptor.com) comes into play. Install the app and set a password—and make sure you don't forget it because, if you do, you'll have no way to decrypt the files you encrypt.

Like most cloud-storage apps, Boxcryptor creates a new drive letter within Windows Explorer. Only, instead of listing your files and folders, the Boxcryptor volume lists the various other cloud service apps you have installed on your system—like Dropbox, for example.

Stick with us.

When you go to view these "services" within the Boxcryptor volume, you'll be staring at the standard synchronized folder you're used to looking at. Only, now, you can use Boxcryptor to encrypt files you've already synchronized—or, one step better, create a new encrypted folder whose contents is automatically encrypted by the app prior to being synchronized with whatever cloud provider you prefer.

Why do we like this method better than, say, TrueCrypt? It's more seamless and "drag-and-droppable," unlike TrueCrypt, which requires you to unmount your entire encrypted volume for the synchronization process to occur—which can get a bit annoying.



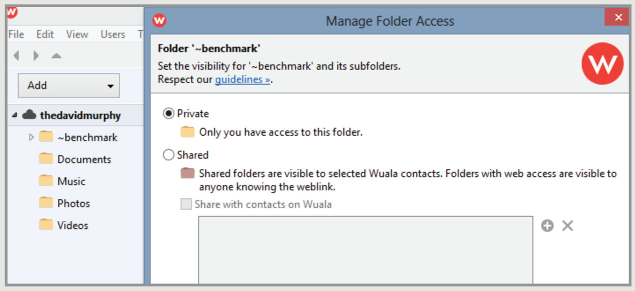
Boxcryptor lets you know that your files and folders are encrypted by displaying their names in a lovely shade of green.

WUALA

LACIE IS BIG on security, offering up AES 256-bit encryption for any file you store on its Wuala cloud service (and going to great lengths to let you know that, no, they aren't peeking at your files). You get 5GB free to start with on Wuala, and an individual file-size limit of 40GB. More storage starts at $39 yearly for 20GB and caps out at a mighty 2TB for an annual fee of a mere $1,999.

Like Tresorit, there's no web-based Wuala interface for you to use (save for when you're sharing files or folders with others via the app's cleverly named "Secret Web-links"). You can synchronize your files to the cloud simply by dragging-and-dropping them in the new W: share drive that the app creates. And Wuala's speedy, too: It took the app just 26 seconds to sync up our 132MB benchmark files.

If you don't feel like dragging-and-dropping, you can also have Wuala synchronize the contents of folders on your hard drives to new folders within Wuala. Popping offline still allows you access to files you've recently downloaded, but it's possible you won't be able to access your entire cloud setup. www.wuala.com



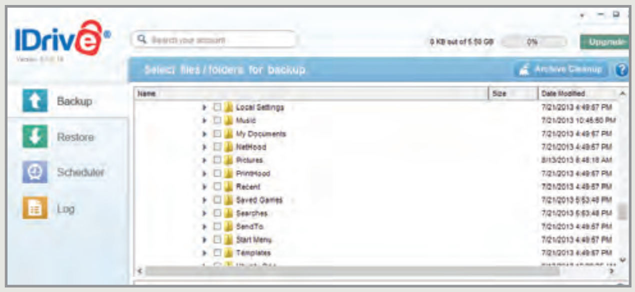
Wuala allows you to fine-tune your file sharing, so long as your friends are also Wuala users.

IDRIVE

THOUGH IT certainly uses the cloud, iDrive operates more as a backup-and-restore app than a true "cloud synchronization" app like so many of its aforementioned peers—or distant cousins. First, the details: You get 5GB of free storage when you sign up, capped at a maximum file-size limit of 10GB per. Adding more storage costs $49.50 for 150GB, $149.50 for 500GB, and $299.50 for 1TB, per year.

Selecting files and folders to back up to your iDrive can be a bit cumbersome via the desktop app, and sending files to cyberspace isn't the speediest of routines. We clocked a total transfer time of 2:48 for our benchmark files; you'll spend far more than that clicking through iDrive's interface when deciding what you want to back up.

iDrive does allow you to share backed-up files with others using randomized links; you can also access your files via iDrive's web app and listen to your music, although there's no provision for watching videos. We like how you can remotely log into your iDrive on a PC via the web to change your to-be-backed-up folders. It's as convenient as iDrive's built-in AES 256-bit encryption is stress-reducing when it comes to keeping your data secure. www.idrive.com



iDrive's "Archive Cleanup" will automatically delete files on your cloud storage when they no longer exist on your hard drive—a beautiful backup feature.

THE CLOUD-STORAGE STANDOUTS: A SUMMARY

AS YOU CAN SEE, cloud storage apps tend to pick and choose from a wide assortment of potential features and, unfortunately, a wide range of speeds. It's hard to find a perfect diamond, but we were most pleased by the luster of one cloud app in particular: **Bitcasa**. It's fast, encrypted, offers more storage than most services for the low, low cost of nothing, and gives you access to an unlimited total capacity for a price that would net you considerably less on other cloud services.

If you care more about security than speed, **Mega**'s your ticket. You don't get a downloadable app with which to synchronize to its servers, but you do get a ton of storage with an almost obsessive focus on security and encryption through all stages of the uploading (and sharing) process. Even Mega's owners seem quite confident of the service's capabilities, offering up cash rewards (up to €10,000!) for anyone who can expose vulnerabilities that might otherwise open up a user's files to pilfering.

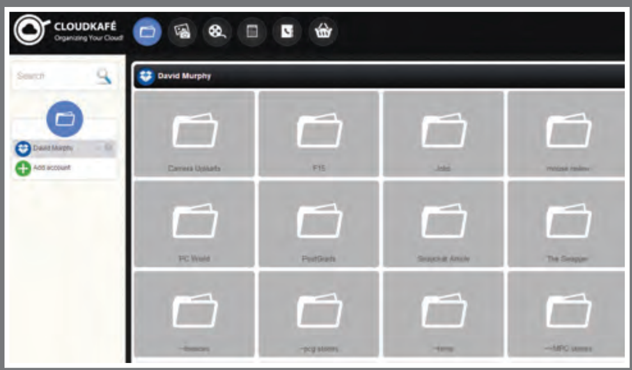
Though we weren't keen on **Box** as a general cloud service, we have to tip our hat to its functionality as an office-themed cloud app. It's not the place where we'd want to stash our critical files, movies, music, or any of that, but the service's tie-ins to Office apps (or Google Docs!) alongside its role-based sharing capabilities make Box an ideal choice for those looking for a cloud service geared toward business-based storage and collaboration.

COMBINE YOUR CLOUD STORAGE

SO, YOU WANT to go the free route. As in, you want to sign up for as many different cloud storage providers as you can get your hands on and find some magical way to mash them together into a single, unified chunk of storage.

The messy way of doing this involves installing each service's desktop app and mentally assigning each to a particular subset of your files—perhaps Dropbox for your MP3s, Bitcasa for your movies, and Box for your documents, etc. It's not pretty, but it's certainly one way to beat the cloud-storage game without having to pony up a single penny.

Let's get fancier.



CloudKafé's interface is a bit more Windows 8 Metro than Windows 7 Explorer, which may or may not be to your file-browsing liking.

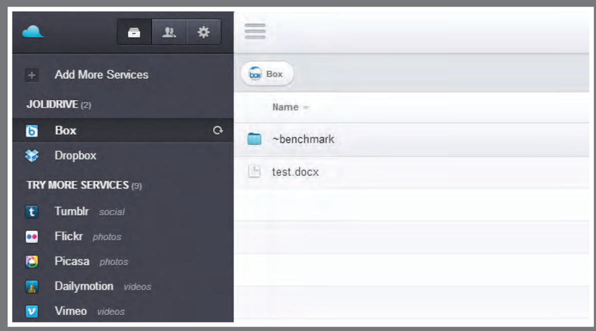
There's a web-based app called Jolidrive (www.jolicloud.com) that allows you to access a number of different cloud services via one convenient portal. The best part of the equation is Jolidrive's cost: absolutely free.

Once you've signed up for the app, you're presented with a screen that allows you to combine your cloud storage accounts with your master Jolidrive account. Supported cloud storage services include a number of those mentioned in this article—Box, Dropbox, MediaFire, SkyDrive, SugarSync, and Ubuntu One (to name a few).

The one bummer? Jolidrive is akin to read-only access: You can't move files around your various cloud services, nor can you even use Jolidrive to upload files—downloading and streaming only.

You'll find that this is the one unfortunate caveat of a number of similar, free services. CloudKafé (www.cloudkafe.com) is another web-based, mash-everything-together cloud-storage organizer—one with a user interface that bests Jolidrive in some aspects. It allows you to share items from your various cloud services by dropping them into a CloudKafé "basket," which you can then allow others to access by emailing them a link via CloudKafé itself.

Want to upload files directly to your individual cloud storage providers via CloudKafé? No dice.

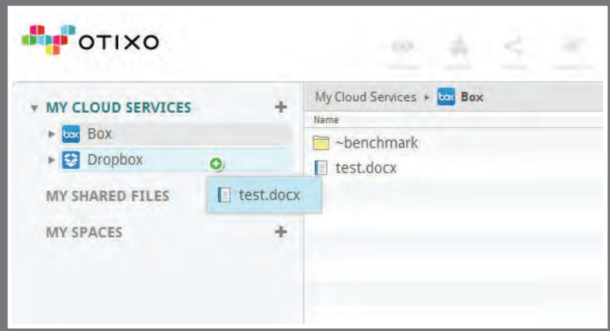


Jolidrive presents a no-fuss method for combining your cloud storage providers, but you can't really do all that much with your data once combined.

The paid-for web app Otxio (www.otxio.com) does allow you to copy-and-paste files between connected cloud service providers, but it'll set you back a one-time fee of $39.99 for doing so. And note that we said "copy-and-paste," not move—the latter being the more desirable way to interact with one's individual cloud services.

We love Otxio's interface and feature-set, in that the app allows you to perform all the basic functionality (downloads, deletions, sharing, and uploads) that you'd otherwise expect to find in your individual cloud services. Like CloudKafé, you can create individual "spaces" of files—groupings of data that can be populated with any of your files from your individual cloud services—which you can then share with others.

That said, Otxio isn't perfect; its file-uploading feature only allows you to stick one file at a time (no folders) into a particular cloud service. What we wouldn't give for a batch uploading feature (or, at least, the ability to upload full folders). Still, it's a small price to pay to be able to ride on the free coattails of the web's more popular cloud storage providers. ⏻



Otxio packs some powerful functionality into its cloud-storage combining, but don't expect a free pass.

Q&A

The Man Behind the Mod

WE TALK TO MNPCTECH OWNER AND MODDER EXTRAORDINAIRE BILL OWEN ABOUT HIS PATH TO POSSESSING THE ULTIMATE GEEK DREAM JOB **BY BEN KIM**

BILL OWEN ISN'T YOUR run-of-the-mill case modder. Twelve years ago, he founded Mnpctech (www.mnpctech.com) and his life changed forever. Now he's one of the most prolific pro modders in the industry. What started as a hobby evolved into a full-time business that he runs with his wife, completing mod projects for companies like AMD, FrozenCPU, and even *Maximum PC*. Mnpctech is also a thriving parts business, selling products aimed at the DIY enthusiast market: milled-aluminum fan grills, custom side panels, vinyl appliques, case handles, Modder's Mesh, and even something they like to call the Modder Reference Tool. We sat down with Bill to learn how he went from dabbling in fan grills and case windows to being the king of modders.



PHOTO CREDIT: BRIAN D. GARRITY

MPC: What did you do before you started Mnpctech?
Bill Owen: I was really into cars; my hobby was restoring classic cars and tuning import cars. A co-worker who was really into gaming knew that I was kind of tinkering around with cases and stuff as just a casual hobby and he asked me if I would modify his next build as a tribute to his Volkswagen GTI. I thought, OK, well, why don't we do some other things like incorporate the door handle as a carry handle on top, and um, try to implement other things, little cues from the car, too.

I was sharing this particular project as a work log, and I was getting a lot of questions about the different types of materials I was using and the different techniques.... At that time, I was kind of working a mundane job at this corporation and thought about getting my A+ certification. And I kind of stumbled into, like, whoa, there's this whole interest in these mods and stuff. And I would just start selling stuff to people through private messages. Like: "Hey, do you have some more of that mesh?" or whatever. And all of a sudden, I'm getting more and more inquiries, and it's interesting and creative. I ended up getting my A+ certification right before Y2K. And after that whole experience, the market kind of just fell out for any kind of tech positions, especially entry level.

More creative projects came up; people contacted me: "Hey, I've got a friend who was in Desert Storm, I would love to do a tribute case for him when he comes back, could you help me out?" Just stuff like that. Over time, more opportunities came up, then it led to doing work for manufacturers. At that time, at trade shows, getting consumer enthusiast builds at their booths, it's going to attract the media to come by and check it out. And so I started doing lots of those types of builds and then getting more and more connections in the industry. Over the last few years, what's happened is there's been a transition, where I've gotten away from doing the custom stuff because it's so few and far between. We focus more on making the products, the case-mod accessories that we have, that are now retailed by other stores.



This Rebel Alliance–themed Cosmos II has two separate water-cooling loops for maximum performance. The distinctive red coolant is a custom mixture of Mayhems dyes cooled by two 480 millimeter radiators mounted on the top and front of the case. Photo by Bill Owen.



This scratch-built tech bench commissioned by FrozenCPU.com is made almost entirely of billet aluminum with a cover that opens automatically to reveal the components inside. Photo by Bill Owen.

MPC: Like Modder's Mesh and fan grills and bezels and stuff?
BO: Yeah, when we started machine-making aluminum parts, they really caught everyone's eye because nobody else was doing it at the time. The Modder's Mesh was selling really well and was making a name for us; people were making their own grills with it, cutting it to make a grill or an intake for their bezel or whatever. I saw that and I came up with a frame, a machined aluminum frame that would have the Modder's Mesh as an insert on the backside. Now it's become a fan grill that you can mount on things. So that kind of took off, and from there I kind of branched into doing other designs. Today, I think we've probably got close to 50 different designs that are machined aluminum. Most recently, we came up with radiator grills because the liquid-cooling market is growing.

MPC: Why didn't you transition into professional modifications for cars instead of computer cases?
BO: Well, it's funny you bring that up because it seems like the majority of the people I run into, especially local customers, are into their cars. There seems to be that common thread with cars, motorcycles, and building custom PCs. I can get the same satisfaction from building a custom rig on my workbench in a nice cozy shop versus being

on a cold, dirty garage floor in a Minnesota winter getting my hands cut up and greasy and dirty.

If things dropped out of this market, if this whole bullshit about the "desktop is dead" crap was true and it actually did hurt us, I probably would segue into making aftermarket parts for cars or motorcycles, for sure, because I have a bit of that background. If not that, my wife has talked about getting into making stuff for dogs [laughter]. We love dogs.

MPC: Where does YouTube fit into your work?

BO: I think YouTube is a very crucial, vital part of us. It's brought in a lot of new customers and hobbyists. When I started doing it in 2006, I was one of the first PC case modders to do video and I had kind of an interest already in doing video production. It's not like our production values were all that great or anything; it's just that we knew how to present stuff clearly, but still entertaining, without wasting your time. Also, my philosophy has always been that you have to give back to the community and your customers in some way. You can't just expect them to sit there and order stuff from your store without educating them about how to do things. So, early on, I made an array of basic tutorials, like how to use a hole saw, what is a hole saw, where do you get a hole saw, how do you attach a hole saw? How do you put a window on a case? How do you add different fans? Just the basic stuff that everybody who gets into this hobby will ask about or research. All of that stuff I covered in videos early on, like 2006–2008, and to this day a lot of those videos draw traffic to our website or social media channel.

MPC: Can you run through a day in your life?

BO: I'm a very, very early riser. I've got my first cup of coffee, if I can, before 5:30 in the morning. I'm on my computer answering emails, that's always number one. I'm managing the The Mod Zoo (www.themodzoo.com) staff for product reviews, so I have to talk to them on a daily basis and there are things that have to be edited and also the community itself. There are people with projects and stuff and discussions going on, so I try to participate when I can. To always show that I'm accessible. I think that's the most important thing to owning a business today. You have to show that you're accessible to your customers, otherwise they're just going to be turned off if they don't get a response. I'm on my computer from early morning until noon or 1:00, and then if there are international shipments, I'll take those to the post office and then I'll go to the workshop. I'll be at the workshop from the early afternoon up until 5:30, and then I'll go home for dinner. Then, I have two machinists who make our parts, and if needed I'll check in on them. Or if there's a custom project we're working on—like currently we're working on a project for FrozenCPU.com—and there are different aspects of that that have to be made or designed, I oversee that. To be honest, I wear so many different hats it's not even funny, but, I think it's the way I'm wired. If there's nothing going on then I'll find something to do. What's funny is, my biggest production day for like actually doing physical fabrication in the workshop is Sunday. I go into the shop and there's no one in the building, so I can turn up my music really loud and I'm not bothered or interrupted by anybody, so I can just buckle down and focus on something being made.

MPC: How do you feel about the difference between using hand tools like saws and dremels versus CNC mills and laser cutters and stuff like that?

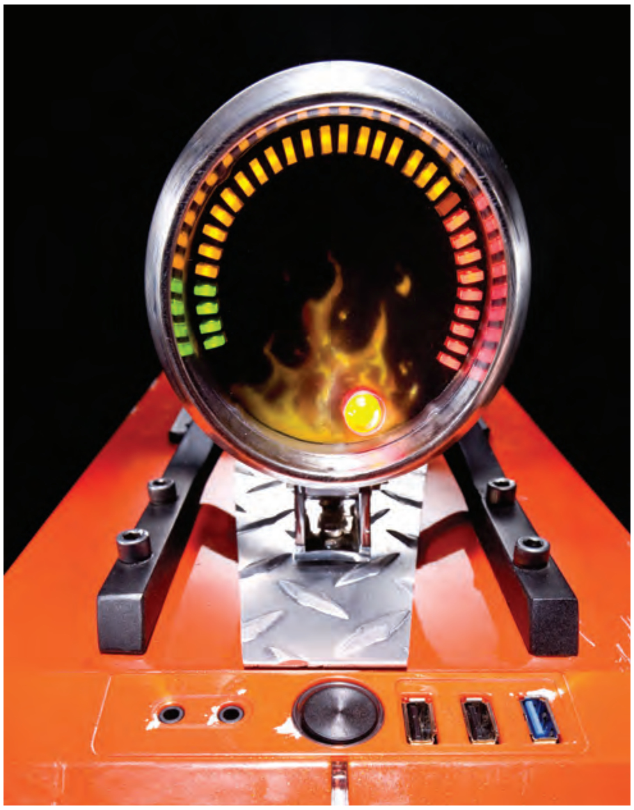
BO: It seems to me that it's a bullshit topic. The thing is, regardless of what the resource is, whether it be laser cutter, 3D printer, CNC, water jet, you have to have the skills and know-how to design that part or understand how it has to be made to fit and work, there's still talent there, there's still skill involved.

MPC: How long do most projects take you?

BO: It always depends on the complexity. Each project I do is always different from the last. I try to not do the same thing over [because] it just bores me. It makes it more special if somebody knows it's not going to be replicated. I mean, I always get people asking, in particular about the Nvidia Cube I did a few years ago: "Oh, could you build me one? I want one, how much is this?" No, that was a one-off, sorry. There's an opportunity where we could really market and sell this, but that doesn't excite me.

MPC: It's like a piece of artwork.

BO: Absolutely! It's hard to think of it that way, but there are a lot of geeks out there that appreciate it that way. You know, it's a big deal, when you do a custom build, even just a case for somebody, and there's all this planning that goes into it. It's a long, drawn-out process and it can be three months, six months, sometimes longer. Sometimes people have to budget it out, but it's a great experience. I think that's part of the



Yeah, that's a tachometer for the case temps in this hot rod–inspired mod. With a metallic-orange paint job and some diamond-plate accents, this is a case for car lovers. Photo by Brian D. Garrity.

fun, the whole experience of planning and doing it. It's more about the journey than the end result.

MPC: Do you usually do a lot of research when you're about to do a themed project, like if you're making a computer for Warfighter?

BO: Yeah, that was a tough one because when it's a new game, the developer will only give you so much. Even if you're AMD or you're Intel, whoever you are, they only give you some screenshots in advance. You kind of just have to draw off that. In military themes, everybody knows the main aspects of a military build. For Warfighter, there was the Medal of Honor badge. We made these huge milled-aluminum badges that were illuminated for the fronts of the cases and it was based on Team Mako or something like that. That was kind of something from digging around. I try to do a bit of research out of respect to the people that appreciate the genre. Because they see those little subtle cues and they're like, "Oh, yeah, all right."

MPC: How do you get past creative blocks?

BO: If my gut says I'm not going in the right direction, I just try to get away from it. Decompress—that means watching a movie, playing a game, listening to music, or going and working on something else. And then you just kind of wait, and then maybe the next day in the shower it'll come to you. Or you're driving somewhere and suddenly: Oh, yeah. Or a friend will come in and say something. Yeah, otherwise I find that you're just wasting time if you're trying to force it.

MPC: Who are some of the people that inspire you, in and outside of the modding community?

BO: Hmm.... When I was a little kid, I used to look at *Hot Rod Magazine*, and custom builders like iconic Big Daddy Ed Roth who created Rat Fink and was one of the earlier car fabricators was a big inspiration. Because it just seemed like there were no boundaries. Just do whatever you want to do; don't feel like you have to follow the rest of the pack. For people



Based on the Corsair 400R, this tribute to
part of the Serenity. Wires and tubes line
the case. Bill's attention to detail is made
wear and tear along the entire chassis. Ph

Best Cases for Modding



FRACTAL DESIGN DEFINE R4
The R4 is a sturdy, simple, and affordable case with an understated design that begs to be modded. Consider adding some lighting, a window, or install a backlit water-cooling loop.



COOLER MASTER N600
It may come with a side window from the factory, but the Cooler Master N600 is a great-looking case that could benefit from smaller mods. Install custom case feet or a carry handle to make it your own.



CORSAIR 400R
If you're going to be cutting up a case, you'll want to start with something that'll stand up to abuse. The Corsair 400R is a solid case with unique, extruded side panels. It's even got room for a slim 240mm radiator on top.



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Based on the Corsair 400R, this tribute to *Firefly* looks like a genuine part of the Serenity. Wires and tubes line the inside and outside of the case. Bill's attention to detail is made obvious by the extensive wear and tear along the entire chassis. Photo by Brian D. Garrity.

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NZXT H630

The NZXT H630 is a case with minimalistic stylings. It's a clean and simple canvas for you to work on. With support for a 360mm radiator straight from the factory, you won't have to struggle with the case while modding it.

today, it's not necessarily a particular person that I'll follow, it's kind of like a collective of everybody that I'll watch. What inspires me, or motivates me, is just seeing people who have never done it before, enjoy it, and get that high from doing it themselves. When you do something for the first time, you get really excited and you're really having fun, and then time just melts away. That's what you're always trying to recreate or chase after.

MPC: What would you say is your favorite project of all time?

BO: The District 9 one and the Firefly one are probably my all-time favorites, and the Pink Floyd one. Being able to do those projects, and a Blade Runner themed one, too. There are these science fiction movies that I've loved and to have an opportunity to do a project as a tribute to them, and then really dig in and research things about them. It's like you have an excuse to have fun and get paid for it. I mean, how much better does it get than that?

MPC: What's your favorite tool?

BO: Hand file, because if you make a mistake on something, if you make a cut, the hand file gives you an opportunity to fix it in a way that requires patience. It's kind of like it forces you to take your time. It's almost like a respect for the artisan ways of the turn of the century. I think a hand tool is just as important as high-end equipment, so I like a good hand file.



The Lanboy Apocalypse is a computer masquerading as a makeshift nuclear reactor. Lamborghini-style side panels open up to reveal a massive 250 millimeter fan that cools the Thermaltake radiator inside. Photo by Brian D. Garrity.



This battle-scarred Fractal Design R4 was given away as part of an AMD promotion for Medal of Honor Warfighter. The custom Task Force Mako case badge and stellar paint job are accompanied by Mnpctech billet case handles and machined-aluminum fan grills. Photo by Brian D. Garrity.

MPC: What's in your PC?

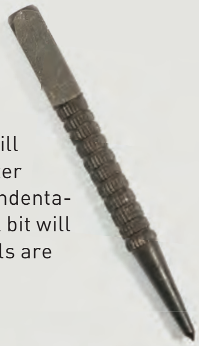
BO: The one I use at home is just a Zotac ITX board with embedded video and audio on it because I pretty much only use that for email and online stuff, maybe some photo editing. The shop one that I'm using right now is another Zotac board and it's got a Zotac GTX 470 with an EK water block on it. I can't even remember what processor I have on this... an i7 2.93GHz. It's really nothing to brag about. I'm the guy who drives the piece of crap car to the shop to work on the exotic sports cars. I live vicariously through my customers. I'm a starving artist.

THE MODDER'S TOOLBOX

ACCORDING TO BILL OWEN, ANY MODDER WORTH HIS OR HER PLEXI SHOULD HAVE THE FOLLOWING GEAR HANDY



JIGSAW
The ultimate tool for making larger cuts. Perfect for cutting out fan holes and case windows.



CENTER PUNCH
These are absolutely critical if you're trying to drill something. A center punch makes an indentation that your drill bit will fit into. Loose drills are dangerous.



ROTARY TOOL
One of the most useful tools in any modder's toolbox because of its many uses. You can use drill-bit attachments, cutting wheels, sanding wheels, and even engraving bits. Use this for detail work.



24-VOLT CORDLESS POWER DRILL
They may be pricier than their 18-volt brothers, but 24-volt cordless power drills are an absolute necessity. Use them to drill pilot holes for your jigsaw, screw holes, and occasionally to tighten a loose screw.



PENCIL
Measure twice and cut once. Use a pencil to mark up what you're cutting before you even reach for your Dremel.



HAND FILES
An easy way to add fit and finish to any project. Sharp and jagged aren't just dangerous qualities, they're also ugly. Sand them down with a hand file.



MEASURING SQUARE
An easy way to make sure that your lines are straight. No one wants a crooked window.



SAFETY GLASSES
Safety always comes first and safety glasses are a must-have. They protect your eyes from stray materials and flying particles.



PAINTER'S TAPE
Cover your cutting area in painter's tape to prevent unwanted scratches, nicks, and scuffs. Write and draw on the tape instead of on your case. Plus, you can always use it while painting.



CLAMPS
Make sure that the side panel or window you're working on doesn't move by clamping it down. These are indispensable if you're going to be doing any sort of gluing, cutting, or drilling.



RULER
The ultimate measuring tool. You're going to need one if you plan on making any precise cuts.

iFixit presents:

AUTOPSY

THIS MONTH WE DISSECT...

Nvidia Shield



About iFixit

iFixit is a global community of tinkerers dedicated to helping people fix things through free online repair manuals and teardowns. iFixit believes that everyone has the right to maintain and repair their own products. To learn more, visit www.ifixit.com.



BACKGROUND:

We're still not sure if Nvidia's Shield is an awesome gaming tablet, or an awesome tableting game console. But we do know what it looks like naked.

MAJOR TECH SPECS:

- Nvidia Tegra 4 quad-core mobile processor
- 5-inch 1280x720-pixel multitouch, "retinal-quality" display
- 16GB flash memory with microSD slot
- 2GB RAM
- 802.11n 2x2 MIMO Wi-Fi
- Bluetooth 3.0
- Android Jelly Bean OS

KEY FINDINGS:

• After loosening a few screws around the base, we're treated to the Shield's interior, which looks nothing like any tablet we've ever taken apart… or game console… or anything.

• The flick of a spudger and a few connectors are all that you need for button-panel-assembly disassembly. We love the modularity of this design. If our button mashing gets out of control, we're happy to know the button board can be replaced separately from other components.

• Next out are the speakers, which are also modular.

• We're able to spudger the forward antenna array off of the battery to free it up. After some fussing, we remove three Sanyo battery cells. A small circuit board connecting them is most likely a charging control circuit.

• The Shield's fan is a breeze to replace—it contains no screws, and its bumpers simply fit into slots on the midframe.

• After removing some screws, we eventually lift out the midframe, revealing a display cable with a fancy connector board. And after 10 minutes of mild terror with a spudger, the display is free of the tape adhering it to its casing. On the back of display we find a few antennas, a single IC, and a display cable.

• The last components to come out of the body are the motherboard and the heatsink.

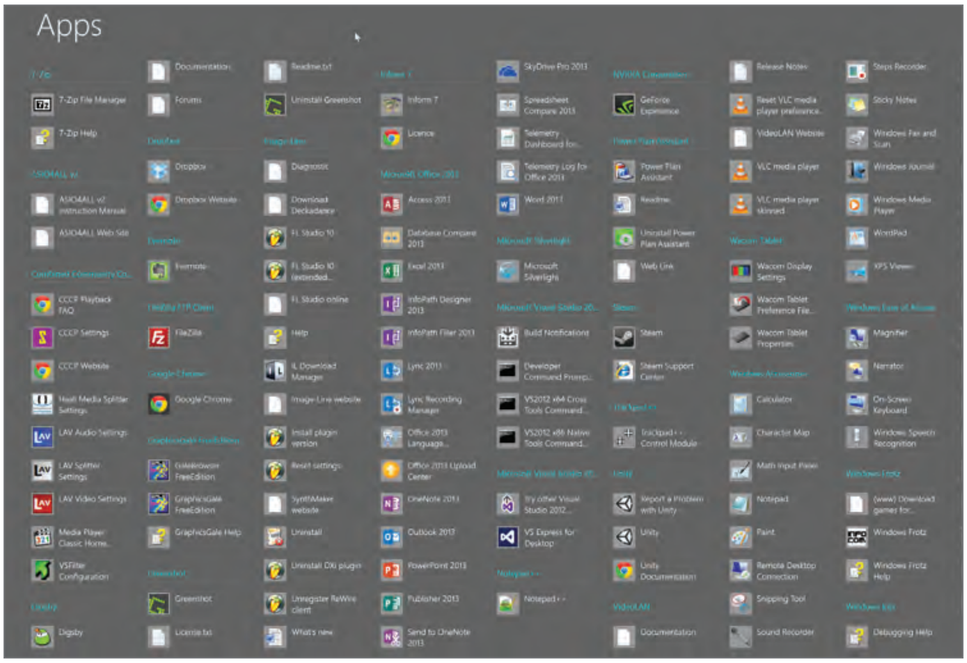
• The silver shield atop the Shield is its own piece, secured to the device by magnets. Easily removed means easily modified—we expect to see some awesome stenciled-up Shields.

Repairability score: 6 out of 10. Modular design means lower repair costs, because small parts can be replaced individually. But a complicated interior design makes repair and reassembly difficult. Also, while the hinge seems sturdy, stubborn adhesive makes display repair risky, and involved disassembly makes removal difficult. The battery is not easily accessible, and will require some tricky disassembly to replace.

HOW TO

STEP-BY-STEP GUIDES TO IMPROVING YOUR PC

WINDOWS TIP OF THE MONTH



GROOM YOUR ALL APPS FOLDERS

If you right-click the Windows 8 Start screen, you have the option to view "all apps," a much bigger selection than what's shown in the regular Start tiles. If your screen is overly crowded, removing unnecessary shortcuts from these two folders will help: %appdata%\Microsoft\Windows\Start Menu and %programdata%\Microsoft\Windows\Start Menu.

MAKE - USE - CREATE





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Edit Videos Online

66
Log into Your PC with Facial Recognition



ALEX CASTLE
CONTRIBUTING EDITOR

TWO TIPS FOR WIN8 SEARCH

ONE OF THE FEATURES of Windows 8 that I immediately appreciated was the fast, powerful Start screen search. Just start typing while in the Start screen, and without a noticeable delay, Windows shows you what you're looking for. Except, it sort of doesn't. Over time, I've discovered two problems with Windows 8 search. Here's what they are, and how to work around them.

1. Results are sorted into applications, settings, and files.

More organization is all well and good, but the way Windows 8 search sorts your files is absurd. Even when there are no application results, you have to manually click the Settings or Files tab to see those results. Here's the fix:

Win + Q – Search for apps
Win + W – Search for Settings
Win + F – Search for files

2. Search only finds files in your libraries.

If you're looking for a particular file in a program directory, for instance, you're out of luck. The best choice for more comprehensive searches is the crazy-fast free search software Everything, available at www.voidtools.com.

↘ submit your How To project idea to: comments@maximumpc.com

Edit Videos Online

YOU'LL NEED THIS

VIDEO CLIPS
All you'll need for this tutorial are some video clips to edit. Everything else takes place in your browser.

VIDEO EDITING isn't the quickest of tasks to do on your computer, and sometimes you just can't wait to get a video online for your friends and family to see. That's why YouTube has launched a video-editing tool that lets you tweak your movies online and then upload them straight to the video-sharing site.

The new YouTube Video Editor enables users to combine multiple existing pieces of footage to create a new, longer video. You can also trim the beginning or end of a clip to make it shorter, and cut out unwanted material. You can even use the editor to add soundtracks, and there's one-click publishing to YouTube so you don't need to spend time re-uploading the newly edited clip. Let's get started! –CHRISTIAN HALL

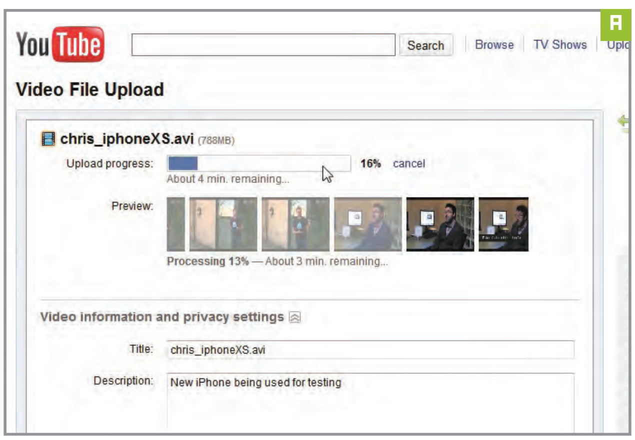
1 GETTING STARTED You need a YouTube account before you can edit your videos on the site. If you've already registered, just head over to www.youtube.com/editor and sign in with your username and password. If you don't have an account yet, go back to www.youtube.com and sign up first. Once you've logged in you'll notice that, like the rest of YouTube, the editor has a very clean look and is easy to navigate.

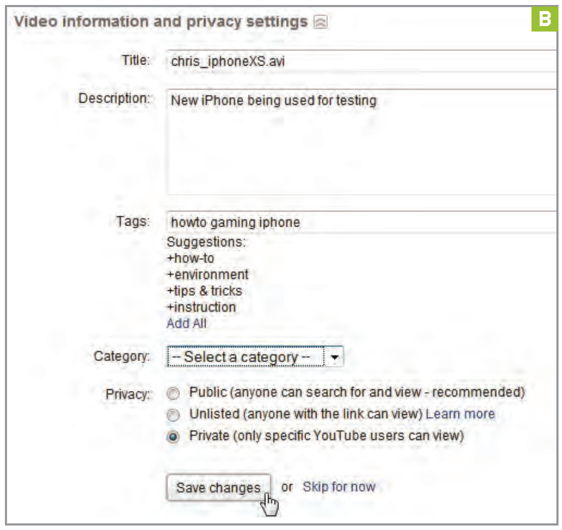
» Enter a title for the edited version of your video. Don't worry, this will not replace the original clips—the editor will create and publish a brand-new video ready for uploading at the end. First, though, we need to upload our clips.

» To get your videos onto YouTube so you can edit them, open up a new tab in your web browser and go to the upload page (www.youtube.com/my_videos_upload). Hit the Upload button and navigate to the video files on your computer, or drag-and-drop them onto the page from your desktop. The upload begins and you can view its progress at the top of the Upload window (**image A**).

» You're going to be uploading a few clips and combining them into a single video, so it's best to choose the Private option from the privacy settings so people don't accidentally stumble across your work in progress (**image B**). The default setting is Public. You can also tag the clips while uploading them, to make sure you group them together in an easily identifiable way.

» Once your clips have been uploaded successfully, go back to the Video Editor tab, refresh the page and you'll see your newly added videos all ready and waiting. Each clip is represented by a tiny thumbnail, and if you need to remind yourself of what each one contains, you can preview each one easily by clicking the Play icon that appears when you hover over it.





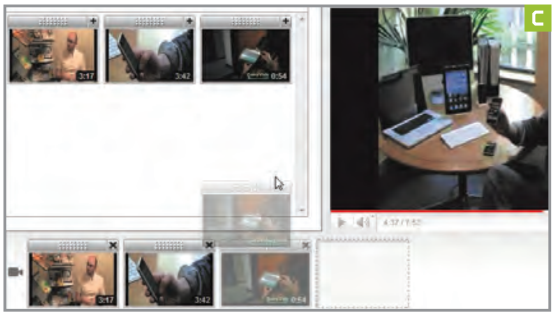
2 EDIT CLIPS To begin editing and combining your uploaded video clips to create a new movie, you need to drag and drop them to the storyboard at the bottom of the page. You can also click the "+" icon in the corner of each clip to add it to the storyboard. If you want to arrange your clips in a different order, simply drag-and-drop them around in the storyboard area (**image C**).

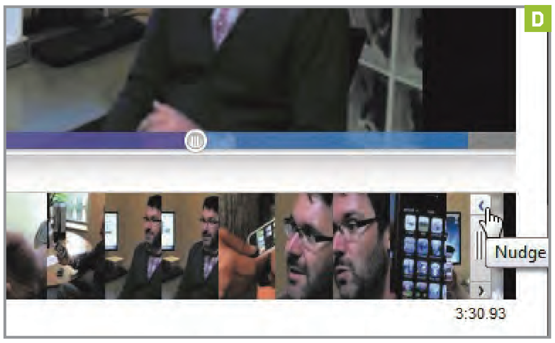
» Many of your clips probably contain portions of footage at the beginning and end that you can discard immediately. Move your mouse pointer over any of your clips on the storyboard and click the Cut icon that appears (it looks like a pair of scissors). This opens the edit window. To cut a clip down, simply drag the trimmer bar at either end and move it to the appropriate place.

» When you're cutting your clips, you'll notice that there are arrows above and below the line of the trimmer tool. You can use these to nudge your video along frame by frame, and fine-tune your cuts so they're just right. Click the arrows to nudge a frame either forward or back (**image D**). You can do this on the trimmer line at either the start or end of the timeline.

» While you're editing one of your clips with the trimmer, you'll see a real-time preview of it above. To play your newly edited clip in full, click the Play button. When you've finished editing bits out and you're satisfied that you've got it just right, choose Save on the bottom-left of the panel and your clip will be returned to the storyboard in its freshly edited form.

» If you click the Play button on the main window on the right-hand side of the editor, the clips in the storyboard will be played seamlessly one after the other to show you what your complete movie will look like. You can use this to preview the video at any stage, but it's likely you'll have to do a little more editing on each clip first to get the results you want.


C



D

3 APPLY FINISHING TOUCHES When you've cut down video segments and pieced them together to make a longer movie, the results might look great, but you'll probably end up with discordant sections of audio. With the YouTube Video Uploader, you can add a new soundtrack in a flash. Select the Audio tab and you're shown over 500 audio snippets to choose from. Use the search bar above to find music you want.

» If you want to hear a preview of an audio track before you add it to your movie, simply hit the Play icon that appears to the right of the track when you hover your mouse over it (**image E**). If you find a piece of audio you like, click and drag it to the audio area of the storyboard (just below your collection of video clips) or press the "+" icon to add the track to your movie.

» To finish off your YouTube video, you need to arrange your clips into the right sequence. You can re-order the clips at any time in the storyboard just by dragging and moving them into a different order. Bear in mind that the finished movie needs to be less than 10 minutes in length before you can save it and upload it to YouTube, so it pays to be quite selective with your editing.

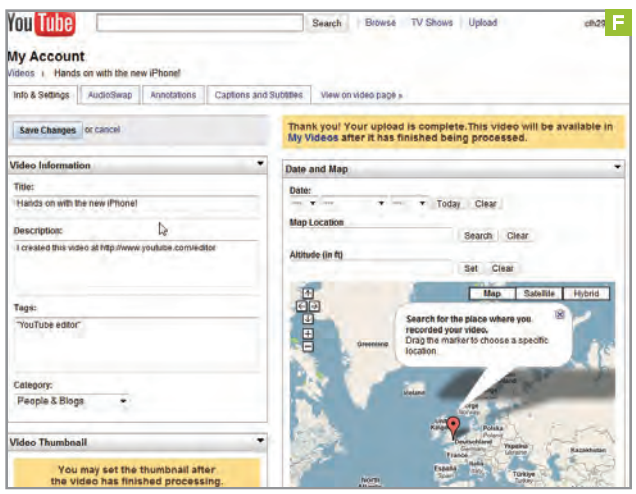
» When you're satisfied that your movie looks and sounds as good as it can, click the Publish button to begin the upload. You'll see a new screen where you can edit some details, including the title and any tags you want to add. You can also geotag the video using the map on the right-hand side of the page (**image F**). Simply choose a date, time, and location, then click Save.

» The Publish screen also has a field labelled Broadcasting and Sharing Options. This is where you can change your video's privacy settings (either Public or Private) and invite contacts to watch it directly by sending them a message. When you do this, you'll be presented with a window where you can write a short message explaining your video invitation.

» Congratulations! You've just made your first YouTube-edited video and uploaded it for the world (or just your friends) to watch and admire. Your YouTube contacts should be able to view it, and they can also press the Like button to give their seal of approval. If you make a video public, you can also use the Like button to gauge how well your video has been received.



E



F

Log into Your PC with Facial Recognition

YOU'LL NEED THIS

A WEBCAM
Facial recognition won't work if your computer can't see you!

KEYLEMON
The free version of this security app is available at www.keylemon.com/product.

WHEN YOU'RE USING a shared computer, or a laptop that could be easily stolen, it's important that your Windows user account is protected by a password to prevent anyone else logging on and accessing your personal data. Having to type in your password every time you log on to your PC can be a pain though, and it can be tempting to leave your account unprotected.

That's where KeyLemon comes in. This clever biometric tool uses your webcam to scan your face each time you log into Windows. Once you've been identified, you're logged straight into Windows without having to touch your keyboard. The process is fast and completely automatic.

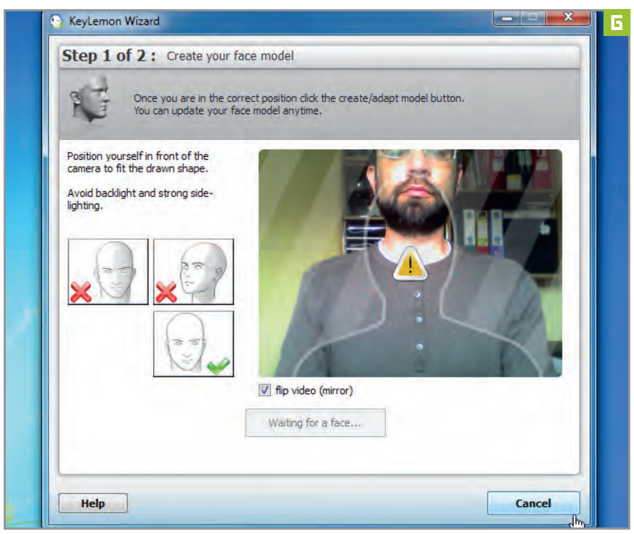
The software is incredibly simple to set up and use, and the free version of KeyLemon has all the features you need to keep your data safe. –NICK PEERS

1 SET UP KEYLEMON First, download and install KeyLemon from www.keylemon.com/product. The setup process is straightforward—just make sure that "Run KeyLemon and create my face model now" is checked before clicking Finish. The KeyLemon Wizard will launch, your webcam should switch itself on, and you'll see yourself on screen, ready to create the face model that KeyLemon will use to log you into Windows.

» You'll notice that a head-and-shoulders frame is overlaid on top of the window (**image G**); try to position yourself or adjust your webcam so you fit within the frame. Once you're in the correct position (a green check on the picture will indicate that KeyLemon is happy with your choice), click the "Create a new face model" button that appears and keep still while the model is created.

» Use the vertical bar to the left of the preview window to check if your face has been captured accurately. The bar should remain green unless you change your position or move your head. If the bar remains red and you're prompted to adapt the photo, do so. Otherwise, click Next Step.

» Next, type a name for your face and choose a thumbnail image to be associated with it (**image H**). The free version of KeyLemon only allows you to store details for one face per user account, so this step isn't important. Pick a thumbnail, enter your password and click Finish.





2 TEST AND FINE TUNE Test your login by clicking Start > Log off. You'll see that the Windows Welcome screen has changed slightly (**image I**). If your face is within range of the webcam, KeyLemon should recognize it and log you into your user account. If it doesn't work, log in with your password, then repeat step 1 (post-installation) again.

» Fine-tune your settings via the KeyLemon Control Center desktop shortcut (or search for it in the Start screen). Many options and settings are restricted to paid-for upgrades, but the core functions are free. If you're unhappy with your model choice, choose another facial shot by clicking Wizard under the General tab, or select Profile to rename or tweak your current model.

» The free version of KeyLemon also comes with a plugin called LemonDay, accessible from the Plugins tab. When enabled, it records up to five photos a day when you log into your PC (you can add your own, too). You can then watch your face change over time via a movie slideshow, which can be shared with others. It's not practical, but your friends might find it amusing!



BUILD IT

TOM MCNAMARA **ASSOCIATE EDITOR**



The Basics of an Open-Air Test Bench

Open-air systems are great for quickly swapping parts in and out, so this month we'll walk you through the basic tenets of building and working with test benches

LENGTH OF TIME: **1 HOUR** | LEVEL OF DIFFICULTY: **EASY**

THE MISSION While we typically follow a standard formula for Build It every month, sometimes it's nice to deviate a bit from the norm and explore different types of systems that are a bit more unconventional. One such system is the type of build we use at Maximum PC HQ for testing hardware, known as the open-air test bench. We have several of them deployed throughout the office alongside our standard-issue desktop PCs, and both types of machines serve an important purpose. The standard desktops are great for YouTube and Reddit, and occasional "work," while the open-air test benches are used for most of our component testing since they let us swap a video card, CPU, SSD, RAM stick, or even the entire motherboard with minimal effort. When you're using an open test bench setup on top of a desk, you'll never again have to dig through the guts of your computer while on your hands and knees, with a flashlight clenched in your teeth. All you need to set up one for yourself is a basic set of spare parts, and it will let you operate like a civilized gentleperson, from the comfort of a chair, without breaking a sweat.



THINKING OUTSIDE THE CASE

THERE ARE A LOT of reasons any died-in-the-wool hardware enthusiast would want to have a test bench up and running at all times. The most obvious is that it's great for quickly testing a stick of RAM, a malfunctioning piece of hardware, or benchmarking hardware outside of a system that needs to be used for productivity. At Maximum PC, our bench of choice is the Top Deck Tech Station Kit made by HighSpeed PC ($140, www.highspeedpc.com). This is a two-tier workbench, where the motherboard sits on the upper tray, and the power supply and storage devices (or other external bay items) sit on the lower tier. The station's legs, rails, and PCI-card support brace are all made of sturdy and nonconductive materials, and the kit supports a decent amount of hardware, too. The top of the tray looks just like a standard motherboard tray in that it has rubber standoffs for clearance. A nylon guide post helps you align add-on cards with their slots in the motherboard, and a bundled neoprene mat helps prevent items in the lower tray from sliding around. In place of your case's power and reset switches, there are switches you plug into the board's front-panel connectors that allow you to turn the machine on, reboot, monitor drive activity, and hear the PC speaker. Yes, they are pricey, but very durable and able to accommodate hardware not even conceived of yet, due to their open-air design and flexibility. As always, there are several things to consider before diving in, so let's take a look at what's involved in letting your hardware go commando.

1 ON THE RAILS

STORAGE DEVICES slide into rails pre-installed on the underside of the upper tray, and they only accommodate 3.5-inch drives. The rails also have no holes for drive screws, by design—you just slide the drive in, then slide it out when you're done. If you want to install an SSD, you'll need to order a 2.5-inch rail kit separately at HighSpeedPC.com. Or you can skip the adapter, since SSDs don't need to be near the 120mm fan that cools the devices in that area, and since they have no moving parts they don't need to be stabilized at all times like a spinning hard drive. The rails are long enough to support two 3.5-inch drives, and we put SSDs on the lower tray dangling from their SATA power cables.



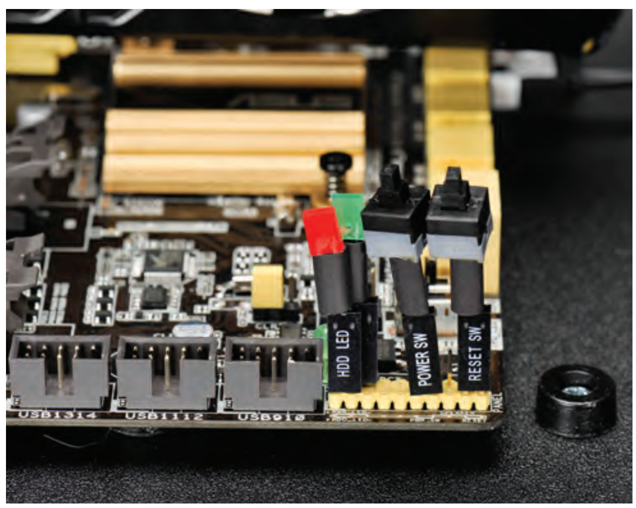
2 MORE ABLE CABLES

A MODULAR POWER supply is extremely useful when trying to keep your cables organized in an open test bench. If you're not using an optical drive, there's plenty of space in the lower tray alongside the power supply to store the bag that contains the unused cables. Orienting the power supply can be a little tricky, since the 8-pin CPU power cable has to go to the top of the board, the 24-pin motherboard cable goes to the side, and the SATA power cables go to the bottom. Therefore, our preferred setup is to have the cables going toward the top of the motherboard, and the AC power plug facing the "bottom" of the motherboard. We also recommend using a stock CPU cooler since it makes accessing the area around the CPU easier, and if you can, just use the CPU's integrated graphics since it gives you one less PCI Express power cable to deal with. If we're testing a CPU without integrated graphics, we just use an old GPU that doesn't require PCIe power.



3 PUSHING BUTTONS

THE BUTTONS and lights on the front of an ATX case are very useful, and allow you to turn on your system, reboot it, and watch CPU and hard-drive activity. Open-air benches have similar buttons and lights—on this model it's called the ATX control kit and features a set of buttons and LEDs that plug into the motherboard's front-panel connectors. It even comes with a PC speaker, so you can hear beep codes in order to help you diagnose hardware issues (unless your motherboard has a debug LED on it, making the speaker redundant). You could always short the power-on circuit yourself with a knife blade, but this is more… dignified.



4 FEELING PINCHED

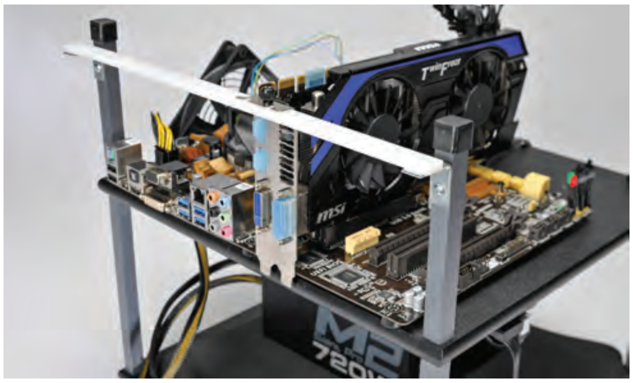
THE TOP TRAY has an array of standoffs that accommodate ATX, eATX, Mini-ITX, and microATX motherboards. The standoffs sit inside rubberized feet secured with Phillips screws, so you can easily pop them out of one spot and stick them into another. No screws actually touch the motherboard, of course; it just sits on top of the rubber feet. Again, this is by design, to make it easier to swap one board for another. It does complicate plugging in power cables though, as pressing down on one edge of the board can raise the other side. When the connector is large, like with the 24-pin power cable, you have to pinch the top and bottom of the board at the same time, sandwiching the connector, as shown in the photo. When the connector is small, like a USB 2.0 cable, you can just support the board from below with your hand, right underneath where the connector is going in.



5 GETTING SOME AIR

THANKS TO THE open design of this workbench, there are no limitations to the length of PCI cards (handy when Nvidia and AMD deliver the latest 12-inch monsters). Cards are slid into their expansion slots and secured to the support bracket with the included plastic screws. The support brace is supported by metal posts but is made of plastic to help prevent static discharge. There are a total of seven screw holes in the bracket, which should be more than enough for any mobo configuration.

Once a video card, hard drive, or RAID controller is installed, you may want to add additional cooling that would normally occur by virtue of a case's airflow, but is lacking in this setup. Your best bet is to just place a 120mm fan on the top tray to move air across the components — jerry-rigged, maybe, but effective. Since the fans are easily accessible, we like being able to control fan speeds with a fan mate, which is an inline fan speed controller. HighSpeed PC also sells extension kits for mounting additional fans on the rim of the upper tray, but we've never felt the need to add that much cooling.



6 DAT MASSCOOL

THE WORKBENCH comes with a pre-installed 120mm Masscool fan with a grill that is mounted in between the bench's two tiers, so it blows air over the top and bottom of the tray, hitting the motherboard and any storage devices sitting in the rails below. The fan is universally compatible too, sporting both a 3-pin and a 4-pin Molex cable, so it'll work with any setup you have. That single fan should provide more than sufficient cooling for a basic workbench. It's surprisingly quiet, but we also use the onboard fan control in our system BIOS to make sure it's silent.

The ATX control kit is not bad, either. Each of the widgets has an embossed triangle indicating the positive wire, so connecting them is simple. It won't damage anything if you install them incorrectly; they simply won't work. Things got a bit tight on our test board when we tried to plug in the semi-stiff PC speaker widget, so we left it off. The workbench also includes an expansion bracket with both power and reset buttons, but it's really cheap and its wires are a rat's nest.



FINAL THOUGHTS

IT PROBABLY TAKES longer to assemble the workbench than it does to install all of its hardware, but once you remove a conventional case from the equation, building goes 10 times faster. You have superior lighting and there is minimal cable management to work out. We also love not having to worry about feeling crowded or lacking in space when building these rigs. There are some downsides, though. This workbench doesn't really allow liquid cooling, as there's nowhere to mount the radiator. It would also be nice to have a couple of fasteners to pin down the motherboard, and we'd love to have an SSD rail included instead of it being an expensive add-on. Also, $140 is a lot of money, but HSPC also sells a smaller ATX bench for $80 that will be fine for most users.

Probably the biggest problem with these setups is the exposed fan blades on the CPU, GPU, and chassis. We can already see a small child or a pet getting in trouble around this thing, so be sure to take precautions before deploying one in your home.

REVIEWS

TESTED. REVIEWED. VERDICTIZED.



INSIDE

Z87 BOARD BRAWL PAGE 76



The Shield is well-constructed, but is a bit too bulky.

Nvidia Shield

Falls short of being a game changer

WITH THE SHIELD, Nvidia aims to deliver a powerful gaming handheld centered around the Android ecosystem and the ability to stream PC games locally onto a mobile device. It's an ambitious endeavor, but is the Shield able to achieve those lofty goals?

At its core, the Shield is an Android device through-and-through, albeit a powerful one. Inside is Nvidia's new Tegra 4 SoC clocked at 1.9GHz. In mobile performance benchmarks, it scored a 19,343 in 3DMark; 4,582 in Geekbench; and 40,541 in Antutu. That makes it one of the fastest, if not *the* fastest, Android part out right now.

All of this graphical prowess is brought to life on a beautiful 5-inch, 720p touchscreen display that offers fantastic viewing angles. A set of phenomenal (for the size) speakers help round out the experience, even besting some laptop speakers we've tested.

Of course, the bulk of the handheld is taken up by the Shield's controller, which shares the same layout and button configuration as the Xbox 360 controller. Even the construction quality is similarly solid, but at 6.2x5.3x2.2 inches, it's a little bulkier and doesn't contour to the hands as comfortably. Furthermore, at one pound, 4.7 ounces, the Shield is also on the heavy side, weighing a little more than two PlayStation Vitas combined. It's a shame Nvidia couldn't have engineered the Shield to come in at a more reasonable weight, as holding the system for extended periods can fatigue wrists. You'll definitely want to rest it on your lap or a table for lengthy sessions.

The center of the controller is where you'll find several physical Android buttons for home, back, volume, start, and the games launcher. One surprising misstep is the lack of any haptic feedback whatsoever, which according to Nvidia was done to save on weight.

As for the operating system, the Shield currently runs a nearly stock version of Android Jelly Bean version 4.2.1. While this may not be the newest version of Android—4.3 at the time of this writing—Nvidia says its goal is to provide the latest OS updates within eight weeks of Google's release. So, this means you can use the Shield just like any other Android device. All your favorite Android apps can carry over and you'll be able to watch movies, listen to music, and surf the web just as you would expect to. Still, it's not a perfect Android experience, as the bulky controller can get in the way of accessing the touchscreen keyboard. Thankfully, the battery life is excellent. Even after watching a four-hour 1080p video on the Shield, the device still had 79 percent battery life remaining.

But you probably don't intend to buy the Shield to just watch movies, so let's get to the real meat of the device: the gaming! Here the Shield offers three options: Android gaming, the ability to stream PC games from your desktop to the device, and emulators. Android games work great on the Shield, provided the games support controllers. We counted about 100 at this point. Unfortunately, some popular standouts such as Crazy Taxi and Need for Speed: Most Wanted do not. The bigger problem with Android games currently is that many are tailored to touch-only devices and are extremely shallow experiences as a result. Furthermore, trying to play with the touchscreen here is quite cumbersome as the bulky controller gets in the way. Although the future of Android games is ever-evolving, it requires too much blind faith for us to trust at the moment.

Perhaps the most interesting feature of the Shield is the ability to stream PC games from your desktop locally over Wi-Fi—akin to the way the Wii U can stream to its tablet controller—but it's marred by some unfortunate setbacks. In order to take advantage of this feature, you'll need a GTX 650 video card or higher and a dual-band router. While we were set on the GPU-side with our Titan, we tried testing the Shield with a typical Linksys E1200 home router. This $45 single-band router couldn't cut it. Switching to a $140 Asus RT-N66U Dark Knight dual-band, the streaming worked well for the most part, with minimal compression and input lag. But even with this premium router, we still experienced random disconnects.

Another disappointment we had is that the Shield is supposed to work with any controller-supported game on Steam, and while it did work flawlessly on a dozen other titles we tried it on, we couldn't get the Shield's controller working with Final Fantasy VII or Sonic & All Stars Racing Transformed, even though both titles work well with an Xbox 360 controller. It's worth noting that the Shield's streaming service is still in beta, so these issues may eventually be resolved, but it's again an issue of faith.

Surprisingly, the most compelling way to game on the Shield at this point is with emulators. It's remarkable how well classic console games run on this thing with little-to-no tinkering. Still, do you want to pay $300 for a portable emulator? No matter how kick-ass that emulator may be, that's not pocket change.

We like the Shield a lot, but its steep price tag, great barrier to entry, bulk, and various bugs leave a lot to be desired. It's a solid freshman effort, but if Nvidia hopes for the Shield to be anything more than a niche product, it still has a lot of work to do.

–JIMMY THANG

VERDICT 7

Nvidia Shield

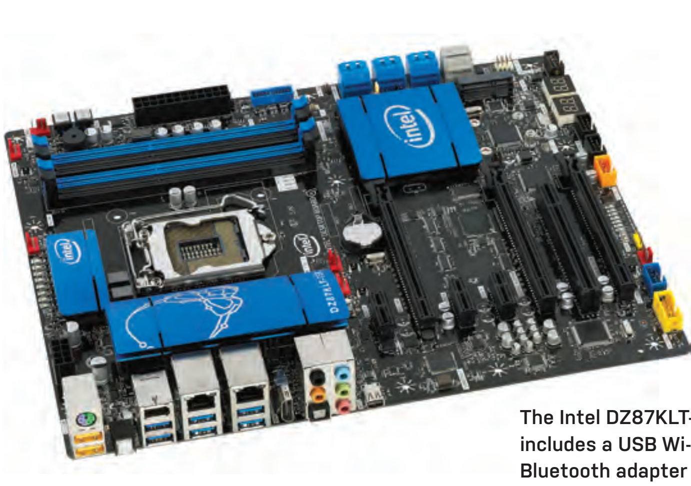
+ CAP AMERICA'S SHIELD Beautiful screen; fantastic speakers; amazing battery life; powerful Android tablet.

– CAP AMERICA'S CODPIECE Bulky; heavy; many features are still wonky.

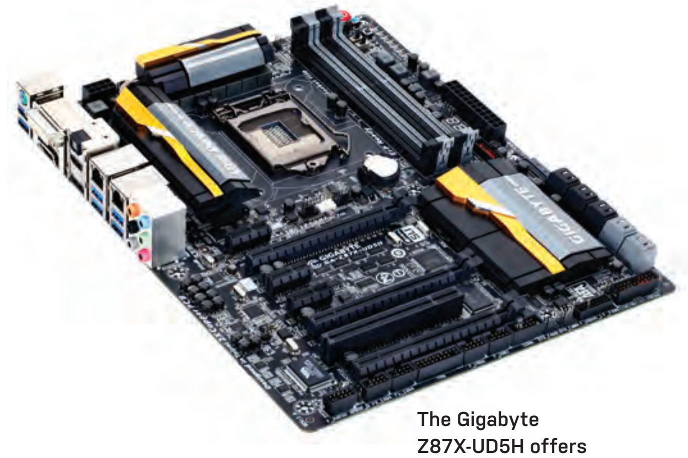
$300, www.nvidia.com

SPECIFICATIONS

SOC	1.9GHz Nvidia Tegra 4
Size	6.2 x 5.3 x 2.2 inches
Weight	1 lb, 4.7 oz
Storage	16GB (flash memory), supports up to 64GB through MicroSD
Display	5-inch IPS display 1280x720
Ports	Mini-HDMI, Bluetooth 3.0, mic, 3.5mm headphone jack, Mini-USB, mini SD card



The Intel DZ87KLT-75K includes a USB Wi-Fi/ Bluetooth adapter that attaches to the inside of your drive bays.



The Gigabyte Z87X-UD5H offers a lot of features for the price.

Z87 Board Brawl

LGA1150 is here to stay—get used to it

We've seen a mixed reaction from enthusiasts toward Intel's new Haswell CPU and LGA1150 socket. Some, like us, see it as a solid piece of hardware with welcome improvements for the platform if upgrading from older hardware. Others have unfurled "Don't Reboot Me" flags and refuse to give up on their LGA1155 socket until we pry it from their warm, moist hands.

For the folks not bunkered in, we're reviewing a pair of Z87-based boards from Intel and Gigabyte to see how they compare to the Asus Z87-Deluxe we reviewed last month. –GORDON MAH UNG

INTEL DZ87KLT-75K

You don't have to subscribe to *Obscure Motherboards Quarterly* to know that Intel has officially thrown in the towel, waved the white flag, and cleared the CMOS on its consumer motherboard division.

In fact, what you're seeing here, the Intel DZ87KLT-75K, is likely the last Intel-branded motherboard that will ever grace our pages. Sure, many of you haters are mouthing, "I didn't even know Intel made motherboards," but the company has been cranking out über-reliable, albeit über-boring, boards for years.

The DZ87KLT-75K doesn't stray too far from that tradition but it would be unfair to call it boring. The board features, for example, a set of handy and clearly marked LEDs to let you know what stage it's in during POST, as well as a set of LEDs to let you see the active load on the VRM. And in a rarity these days, the board even has a built-in speaker to let you monitor beep codes. Add in Thunderbolt, six fan headers, properly labeled DIMM slots (take a hint, Asus), dual Intel-NIC Gigabit ports, surface-mounted power switches, 802.11n and Bluetooth 2 modules, and SLI and CrossFire support, and you get a really feature-packaged mobo for the money. Compare that with the Asus Z87-Deluxe we reviewed last month, which tips the scales at $280. Sure, the Asus board gives you 802.11ac and some pretty nifty utilities, but the Intel board can be found for $260 and offers Thunderbolt, to boot.

The only problem for the Intel board is how it performs. Generally, performance testing of motherboards is a formality, as we rarely see any difference between them. It's only become more irrelevant as the memory controller and so much other functionality has moved from the chipset into the CPU itself. So imagine our surprise when the DZ87KLT-75K came in dead last in most of the benchmark runs. (For the record, we use the exact same components in all of our motherboard tests and verify clock speeds and bclocks under single-threaded and multithreaded loads in the initial preflight setups. We also use the latest available mobo drivers and BIOS and do clean installs of the OS.)

We originally assumed the Asus Z87-Deluxe just pushed the CPU harder by default, but the Intel board also got body slammed by the Gigabyte Z87X-UD5H, which isn't pushing the chip nearly as hard as the Asus board. We honestly can't explain why the Intel board's performance was off the mark.

Back in the good-news column, we're impressed by Intel's new UEFI implementation on the DZ87KLT-75K. Since UEFI has come along, we've seen just about every attempt at making a functional but pleasing interface. Asus has been ahead of the pack for a long time, but we have to honestly say that Intel's implementation could actually be our favorite now. With most UEFI implementations, the laggy mouse response usually forces us to switch from missiles to guns—err, from mouse to keyboard—to scroll around, but Intel's UEFI is the most responsive we've seen, and hell, even the right mouse button works.

What polish there is in the UEFI runs out of steam in the OS, though. While Asus's and Gigabyte's OS utilities show refinement, Intel's hasn't changed much. And overclocking is a manual affair in both the BIOS and OS. Phooey.

There are really two issues here. The first is that the performance is oddly off the mark, which we're still investigating. Assuming it's just our board sample or some "outlier" Gremlin, the second problem is perhaps larger: Intel doesn't intend to make boards after the Z87 chipset. The company says it will support boards for three years, but we'd guess the support in the last half of that won't exactly be sterling.

It's true that few board makers bother to update the BIOS after the first two years, but at least they're still in the motherboard business. That won't be the case with Intel. For a lot of people, that's really going to be a deal breaker, which is a shame, because this board has some nice qualities.

VERDICT 6

Intel DZ87KLT-75K

$260, www.intel.com

GIGABYTE GA-Z87X-UD5H

The world's economy may be on the mend but a lot of people still want to justify every cubit spent on technology. For some people, spending $280 for the Asus Z87-Deluxe (reviewed in October) or even $260 for the Intel DZ87KLT-75K may seem exorbitant.

Fortunately for you, budget-minded power user, Gigabyte has its GA-Z87X-UD5H board. OK, we'll admit, $210 isn't *really* budget, but you'll see that it's a pretty modest price given the board's features.

The Z87X-UD5H gives you SLI and CrossFireX support, 10 SATA 6Gb/s ports, dual USB 3.0 headers, dual NICs, a POST LED, surface-mounted power and reset buttons, Creative Labs X-Fi MB drivers, and Gigabyte's trademark dual-BIOS setup. We've had the unfortunate need to resort to the dual-BIOS in the past, and it's been an automatic affair. The UD5H offers both automatic and manual mode, which we got to use when we bricked the primary BIOS. No problem, flip a switch and you're back up and running on the backup BIOS. From there, you simply flip the switch back to the primary and reflash the BIOS again. It's pretty damned robust.

The last time we reviewed a Gigabyte board, we complained hardily about the goofy UEFI (hey, that rhymes), with its faux "3D" mode. Gigabyte has since redone its BIOS with a vastly improved interface. Unfortunately, it's still not in the class of Asus's and now Intel's excellent UEFI. In fact, we went back to "classic" BIOS mode because the sheer amount of information on the UEFI screen is overwhelming.

One area where Gigabyte has really improved is in its OS utilities. For some time now, we haven't been happy with the gear-shifter style interface and confusing options and usually just avoided them. With the UD5H, the utilities have gotten a complete makeover that actually makes them competitive with Asus's excellent utilities. For example, Gigabyte now has its own equivalent of Asus's Fan Xpert2 that's pretty good. It's not as granular or nerdtastic in settings but it's a step in the right direction. And Gigabyte even aces Asus is the update utility, which can find and fetch mobo drivers and utilities for you. This isn't a breakthrough feature, as MSI used to do this (although not very reliably), but it's a welcome feature that we'd love to see other board vendors also implement. The upshot is that the utilities are something to actually be used, not just installed once and ignored.

In performance, the Z87X-UD5H holds its own. Both the Intel and Gigabyte boards showed default multipliers of 8–39 on our Core i7-4770K, while the Asus had a default multiplier of 8–43. This gave the Z87-Deluxe a decided advantage in several benchmarks—but the Z87X-UD5H got pretty close. It also managed to smoke the Intel by a good margin.

In the audio department, the board uses the same ALC898 as the Intel board, but Gigabyte licenses Creative's software algorithms, including its Crystalizer and voice-changing features, among others. We're fans of the Crystalizer, which is a nice upgrade over the stock Realtek audio applets we usually see. We also did some close listening tests using a set of gaming headsets while hammering the USB 3.0 port with gigabytes of data, and couldn't discern any snap, crackle, or pop.

Our overall view of the GA-Z87X-UD5H is that it's probably the sweet spot for most enthusiasts who could put the money saved by forgoing Thunderbolt or Wi-Fi into the CPU, GPU, or SSD instead.

VERDICT 9

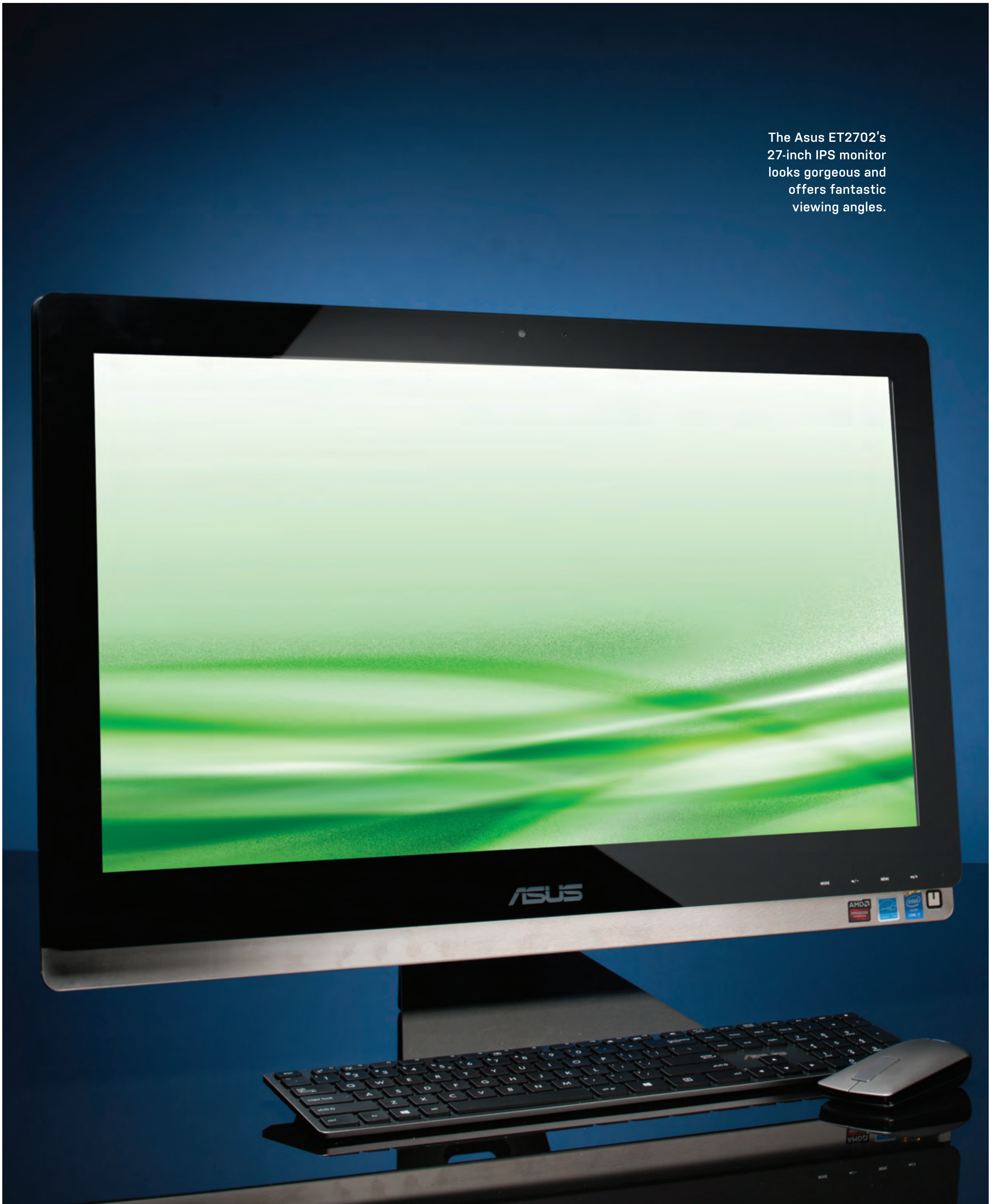
Gigabyte GA-Z87X-UD5H

$210, www.gigabyte.com

BENCHMARKS

	Intel DZ87KLT-75K	Gigabyte Z87X-UD5H	Asus Z87-Deluxe
Street price	$260	$210	$280
3DMark Firestrike	8,563	8,653	**8,694**
3DMark Graphics	**9,736**	**9,737**	9,715
3DMark Physics	10,137	11,062	**11,676**
PCMark 8 Home	5,146	5,410	**5,824**
PCMark 8 Creative	5,340	5,619	**5,925**
PCMark 8 Work	4,947	5,408	**5,562**
Cinebench 10 single-threaded	7,282	7,525	**8,055**
Cinebench 10 multithreaded	27,495	30,097	**31,168**
SiSoft Sandra Memory Bandwidth (GB/s)	**24**	**24.34**	**24.07**
CrystalDiskMark Seq. R/W (MB/s) on SATA 6Gb/s	**541 / 520**	516.9 / 497.3	531.1 / 507.1
CrystalDiskMark Seq. R/W (MB/s) on USB 3.0	432.8 / 348.9	**437.0 / 377.9**	428.7 / 371.7
Valve Particle (fps)	196	**214**	**213**
Resident Evil 6 low-res (fps)	20,666	22,380	**22,424**
Hitman Absolution low-quality (fps)	71.9	80.27	**82.3**
Hitman Absolution high-quality (fps)	56.6	**67.5**	65.7
Auto-overclock	N/A	4.5GHz	4.6GHz

We used a Core i7-4770K, 16GB of DDR3/1866, GeForce GTX 780, Corsair Neutron GTX 240GB SSD, Cooler Master Hyper 212 Evo, and Windows 8 Enterprise for all our testing. USB 3.0 and SATA 6Gb/s performance was tested with a 240GB Samsung 840 Pro.



The Asus ET2702's 27-inch IPS monitor looks gorgeous and offers fantastic viewing angles.

Asus ET2702IGTH

Beauty on the outside, beast on the inside

UP UNTIL this point, most all-in-ones haven't truly earned the word "all" in their moniker, due to their sacrifice of power or functionality in favor of a more compact size. Asus hopes to buck that trend with its ET2702IGTH AiO. Not only does it have a 27-inch screen—large enough to replace many bedroom TVs—but it features a built-in TV tuner, supports HDMI in/out, and has enough horsepower for your basic gaming and computing needs.

The ET2702's most striking feature is its beautiful edge-to-edge, glossy, 2560x1440-resolution IPS display, which offers an impressive 178-degree viewing angle and vibrant colors. The ET2702 has the required 10-point touch—although, like just about all of the other AiOs we've tested, it has a hint of input lag. Another small quibble we have with the display is that it can't bend back flat like Asus's ET2300 AiO, which just so happens to be our zero-point AiO. Regardless, ET2702's 25-degree tilt range is versatile enough for most uses. The ET2702 is also VESA-mount compatible, so it can be attached to a wall, though the mount is sold separately for $70.

Spec-wise, the ET2702 has a lot going for it. It has 8GB of DDR3 RAM, a 2TB HDD, and plenty of inputs, including four USB 3.0 ports, two USB 2.0 ports, an SD card reader slot, mic/headphone inputs, an Ethernet jack, and a Blu-ray combo drive. The brains of the operation is Intel's new Core i7-4770 quad-core Haswell CPU clocked at 3.4GHz. While Haswell has greatly improved integrated graphics, Asus didn't want the ET2702 to rest on Intel's laurels and threw in AMD's HD8890A discrete graphics card.

All around, the ET2702's impressive specs make it the most powerful AiO we've tested to date. Its Haswell CPU clobbered our zero-point's Ivy Bridge by roughly 30 percent in both Stitch.Efx 2.0 and x264 HD benchmarks. Its least impressive gain was a 7 percent win in our ProShow Producer test. Graphics-side, the ET2702's HD8890A video card, equipped with 2GB of DDR5, performed a staggering 200 percent better in 3DMark 11 than our zero-point's GeForce GT 630M. In our Metro 2033 test, it performed 77 percent better—that's the difference between a playable game and a slideshow.

We don't normally test AiOs with super graphically intense games because, frankly, they haven't been powerful enough up until this point; but considering that the ET2702 uses a new beefy video card from AMD, we figured we'd boot the graphically demanding Far Cry 3 to give it a real-world workout. Initially, the AiO struggled running the game on medium settings at its ridiculously high 2560x1440 native res, producing an average frame rate in the high 20s, but when we lowered the resolution to 1920x1080, the frame rate jumped to the high 40s. While not exactly mind-blowing by gaming desktop standards, these results are very impressive for an AiO.

On the audio side, the ET2702IGTH features four 3-watt speakers built in below the monitor. They handled surround audio well and offered plenty of volume firepower. There's also a separate subwoofer available, though it costs an extra 50 bucks.

The included accessories are a bit of a mixed bag. On the upside, the wireless keyboard uses black chiclet keys that not only match the look of the ET2702 but are also easy to type on, and the entire thing has a nice weight to it. We were less enamored with the mouse, however, which eschews the middle mouse scroll wheel in favor of a weird trackpad-esque button, which enables both vertical and horizontal scrolling, but comes at the expense of responsiveness; we would have preferred the traditional scroll wheel.

Perhaps the ET2702's biggest hurdle, however, is that it costs $1,900. If you can get over its relatively steep price tag and are looking for a PC that doesn't take up much space, offers good power, and has a beautiful screen, then Asus's new AiO is right up your alley. –**JIMMY THANG**

VERDICT 9

Asus ET2702IGTH

➕ **STEVEN SPIELBERG ET** Beautiful display; very powerful for an AiO.

➖ **KANYE WEST ET** Weird mouse; not cheap; no SSD.

$1,900, www.asus.com

BENCHMARKS

	ZERO-POINT	
Stitch.Efx 2.0 (sec)	1,192	908
ProShow Producer 5 (sec)	1,841	1,720
x264 HD 5.0	9.9	12.7
Metro 2033 (fps)	22	39
3DMark 11 Perf	1,333	4,004 (200.4%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero-point all-in-one PC is an Asus ET2300 with a 3.0GHz Intel Core i5-3330M, 8GB DDR3/1600, 1TB 7,200rpm hard drive, a GeForce GT 630M, and Windows 8. Metro tested at 1280x768 with Medium settings, Tessellation enabled.

SPECIFICATIONS

CPU	3.4GHz Intel Core i7-4770
GPU	AMD Radeon HD8890A (2GB of GDDR5)
RAM	8GB DDR3/1600
HDD	2TB HDD
Optical	Blu-ray combo drive
Display	27-inch IPS display 2560x1440 (10-point touchscreen)



The GTX 780's all-new Cool Tech cooler contains two separate fans to move air into and across the heatsink.

Asus GeForce GTX 780 DirectCU II OC 3GB

The GTX 780 overclocking champ

LAST MONTH, we took a look at EVGA's GTX 780, which sported a new, fancy-britches "ACX" cooler. This month, it's Asus's turn with its own redesigned and totally non-reference GTX 780. At first glance, this GPU's most notable attribute is its redesigned cooler, which despite many changes still bears the DirectCU II moniker we've seen on previous models. The new design uses five direct contact (DC) copper heat pipes, one of which is a plump 10mm, along with a primary "hybrid" fan that has two sets of fan blades to blow air in two directions at once. The cooler takes up two PCIe slots, and has an aluminum backplate wrapped around it to help support the cooler and dissipate heat across the top of the card. Our favorite feature of this cooler is that it can be detached from the card with just four screws, making it easy to clean before company comes over.

Cooler aside, this is a complete Asus card from top to bottom, aside from the Nvidia GK110 GPU at the heart of it, that is. It uses a custom PCB with Asus components, including super-alloy power chokes and caps, Digi+ VRM with 10-phase power delivery, and all the other Asus buzzwords that boil down to "top-shelf hardware." Top. Shelf. Since this is the OC version, it's overclocked just a tiny bit over stock—26MHz to the base clock, to be exact, and no memory tweaks—but that's just the tip of the iceberg, as this card was built for overclocking. This card sells for $700, which is $50 over MSRP and makes it the most expensive GTX 780 we've tested yet.

To test this card, we first established an overclocking baseline and then benchmarked it. We were able to overclock it higher than any other 700-series GPU, and ran it at 1,256MHz Boost clock, 110 percent power target, and 246MHz GPU clock offset. We also were able to overclock the memory by an eye-popping 1.1GHz. When we tried to play around with the voltage, things went sideways, but Asus does include the VGA hotwire leads for those who want to get crazy.

The card took the crown as the fastest GTX 780 we've ever tested, but only by a very small margin over the EVGA GTX 780 SC ACX despite costing $40 more. It was also faster than the GTX Titan in some tests, as well, making it one kick-ass card. We were able to loop Heaven and Furmark overnight running at the overclocked settings above, too, and it was rock solid, hitting temps of 75 C with the fan set to "auto," where it was barely audible. We also ran the card with the fan at its lowest setting, which is 37 percent, and it was totally silent, and ran with no issues at 79 C, but downclocked itself to 1,228MHz.

This is a great card, although it would have to be a bit faster and a bit cheaper to hit "legendary" status. We're also not big fans of the GPU Tweak software, but you can always download EVGA's PrecisionX. –JOSH NOREM

BENCHMARKS

	Asus GTX 780 DirectCU II	EVGA GTX 780 SC w/ ACX	GTX 780 (Reference)	GTX Titan	PowerColor AMD Radeon HD 7970 GHz
Driver	320.49	320.49	320.18	320.49	13.5 Beta 2
3DMark Fire Strike	**10,090**	9,607	8,482	9,892	7,138
Unigine Heaven 4.0 (fps)	**42**	40	35	40	24
Crysis 3 (fps)	**34**	27	24	32	24
Shogun 2 (fps)	56	55	48	**63**	43
Far Cry 3 (fps)	**42**	**42**	35	**42**	30
Tomb Raider (fps)	**26**	25	25	25	20
Metro: Last Light (fps)	**25**	24	22	**25**	14
Battlefield 3 (fps)	**58**	55	53	55	41
Catzilla Beta	**8,142**	7,660	6,933	7,926	4,889

Best scores are bolded. Our test bed is a 3.33GHz Core i7 3960X Extreme Edition in an Asus P9X79 motherboard with 16GB of DDR3/1600 and a Thermaltake ToughPower 1,050W PSU. The OS is 64-bit Windows Ultimate. All games are run at 2560x1600 with 4X AA except for the 3DMark tests.

VERDICT 9 KICK ASS!

Asus GeForce GTX 780 DirectCU II OC 3GB

+ OC Overclocks like crazy; super build quality; quiet and cool.

– OD Too expensive; software is not the easiest to use.

$700, www.asus.com



Good luck opening the front door—it's seemingly made for inhumanly skinny fingers.

Thermaltake Urban S41

Lots of promise, little practicality

THERMALTAKE'S URBAN S41 comes with all the trappings of a case that's bound for success… and then you start to use it.

Take, for example, the Urban S41's front panel. If a manufacturer puts a swinging cover on the front, common sense dictates that it should be fairly easy for someone to grab the edge of said cover to, you know, open it.

Not so with this chassis. There is no way to get any kind of traction on its front-panel cover unless your fingers are as flat as popsicle sticks or you reach all the way to the bottom of the case's front to grasp the one section that you can get a decent grip on. Put this case under your desk, and you're in for quite an unpleasant stretch.

The front panel conceals the system's four 5.25-inch bays, covered by plastic panels that feel a bit cheap to the touch. On the bottom half of the case's front is a similarly flimsy panel that covers the case's front 12cm fan with plenty of room to spare. Plastic bars cut across the opening between the fan and the panel, making upgrading difficult for those looking to swap in new cooling.

Two USB 2.0 ports and two USB 3.0 ports adorn the top of the case's front. On the top of the case itself, the power and reset buttons are joined by a "low" and "high" switch for the case's built-in fan controller—one that you can't actually connect more than two fans to (it controls the front 12cm and top 20cm fans by default). This case's killer feature is the 2.5–3.5-inch docking slot built into the chassis to the rear of these buttons.

Annoyingly, the flimsy plastic panel covering the rest of the case's top is a trap. Applying any force to it whatsoever is likely to make it pop clean off, a fact we learned when we first attempted to pick up the case and nearly dropped it on our feet.

The case's side panels are covered in foam in an effort to dampen noise. Unfortunately, the largest source of noise on the Urban S41 is its top fan (whether you select the "low" or "high" setting on the fan controller), and there's no foam on the accompanying panel to shield your ears from the racket.

We appreciate the case's four screwless 5.25-inch drive bays; the case's five 3.5-inch drive trays a little less so, as they still force you to physically screw in your storage. Worst of all, though, are the screws holding the case's slot covers in place. The thumbscrews are actually located on the rear-outside of the chassis, and they're impossible to manipulate with your fingers.

The Urban S41 comes with ample room between its motherboard tray and its side panel (and plenty of rubber-outlined holes) for all of your cable routing, and your motherboard standoffs are already built into the tray for you. There's a big, fat cutout behind where your CPU will sit for easy aftermarket cooler installations, and a single 12cm fan blasts air out the rear of the chassis.

Still, combining all of the case's successes can hardly overcome the mountain of failures created by the rest of its annoying design. –DAVID MURPHY

VERDICT 5

Thermaltake Urban S41

➕ **URBAN COWBOY** Ample but loud cooling; built-in fan controller; hard-drive docking bay.

➖ **SUBURBAN COMMANDO** Flimsy plastic covers for drive bays and case's top; front-panel cover is difficult to open.

$140, www.thermaltake.com



The TD02 gets points for style and toughness, but the extra-thick radiator may not fit in your case.

Silverstone Tundra TD02

Worth the weight

IF YOU'VE BEEN following the CPU-cooling market over the past year or so, you've probably noticed some stagnation. Multiple vendors license a design from a few manufacturers, resulting in a roughly identical product. Sometimes the fan control software is the same program with a different skin. Wouldn't it be nice to shake things up a bit? Silverstone seems to think so, and it seems to understand that it's not just about looking fancy.

The Tundra TD02 closed-loop cooler is immediately distinctive, with brushed-aluminum banding around the 240mm radiator, decorative white strips on each end, and white tubing connecting the rad to a copper block housed in more aluminum. Silverstone also trumpets higher radiator fin density. Because of these features, the TD02 is more than double the weight of a comparable 240mm cooler; it's also 75mm thick after the fans are installed, and that extra 20–25mm won't fit in a number of mid-tower cases. The extra metal also drives up the price a bit.

On the bright side, installation was pretty breezy. The TD02 comes with Intel CPU brackets pre-installed (AMD brackets are bundled in the retail box), and they're sturdy aluminum. Remove four screws to swap the brackets. The backplate is solid steel, as well. The tubing has a plastic sleeve, so it's not super flexible, but it does help prevent the tubes from getting accidentally slashed open. The unit as a whole has a rugged feel, and Silverstone reinforces that impression with a five-year warranty, matching Corsair's H100i as the longest available.

Silverstone does not share the same cabling system, though. Instead of hooking into a SATA or Molex cable, you just connect the sleeved 4-pin fan cables to a sleeved and bundled Y-adapter, and connect that to your motherboard's CPU fan header. The pump has a 3-pin fan that you can connect to a nearby case fan header. So you will be using your board's fan controls instead of software provided by Silverstone. Our board uses Asus's Fan Xpert2, so that was no big deal. We don't think that a lack of bundled software is necessarily a bad thing, but it's worth mentioning.

The fan behavior is also pretty different. This AS1225H12 model (also bundled with Silverstone's Argon AR03 air cooler) is officially rated to idle at 1,500rpm, which is fairly high for 120mm units. But in our test rig, the fans hovered at just over 1,400rpm, and did not crack 1,700rpm on "silent" mode when we put the CPU under full load, using Intel's internal torture-test software. As a result, the cooler maintained impressive acoustic levels. Silverstone has worked hard on its own fan designs to reduce noise from air turbulence, and that dedication bears fruit with the TD02.

While the NZXT Kraken X60 arguably has the best performance among closed-loop coolers, its 280mm-class radiator won't fit in a large number of mid-size cases, and it has a plastic backplate and three-year warranty. The H100i is the other main contender; like the TD02, it has a five-year warranty and metal backplate, but it also gets comparable performance from a conventional size, giving it an edge when it comes to case compatibility. –TOM MCNAMARA

VERDICT 9

Silverstone Tundra TD02

+ BARN DANCE Excellent performance; smooth installation; rugged and distinctive design; five-year warranty.

− RAISED IN A BARN Pretty bulky; relatively expensive.

$120, www.silverstonetek.com

BENCHMARKS

	Tundra TD02 Quiet / Performance Mode	Kraken X60 Quiet / Performance Mode	H100i Quiet / Performance Mode	212 Evo Quiet / Performance Mode
Ambient Air	19.8 / 19.8	20.9 / 20.7	20.3 / 20.5	20.5 / 20.0
Idle Temperature	29.8 / 29.5	**29.67 / 28.8**	30.7 / 29.3	35.5 / 30.5
Load Temperature	**65.8** / 63.0	66.0 / 61.8	67.1 / **61.0**	70.0 / 67.3
Load - Ambient	46.0 / 43.2	**45.1** / 41.1	46.8 / **40.5**	49.5 / 47.3

All temperatures are in degrees Celsius. Best scores are bolded. All tests were performed with an Intel Core i7-3960X at 4.1GHz, on an Asus Rampage IV Extreme motherboard, in a Corsair 900D with stock fans set to Standard.

SPECIFICATIONS

Radiator Dimensions (H x D x W)	1.77 x 10.94 x 4.88 inches
Weight	4.1 lbs
Stock Fans	2x 12cm PWM
Socket Support	LGA1150/1155/1156/1366/2011; AM2/AM2+/AM3/AM3+/FM1/FM2
Additional Fan Support	2x 12cm (screws not included)

Proof that we take our hardware testing seriously.





ioSafe N2 NAS RAID

A disaster-proof NAS designed for the apocalypse

BACK IN 2011, we took a look at the ioSafe SoloPro USB Backup Drive, which offered a lone SATA hard drive wrapped in a bombproof skeleton of steel, ceramic, and plastic. That drive was awarded a 9/Kick Ass verdict for its ability to withstand both fire and water, which is the typical outcome when a house is engulfed in flames then doused by the local fire department. IoSafe recently released a new drive with even more protection, the N2 NAS RAID, which, as its name implies, is two drives in a redundant array in a NAS box. This top-shelf storage device runs a Synology OS and comes with one year of "no questions asked" data recovery service, so you're covered if you drop the NAS or your kid drops an ice-cream cone into it. This level of protection doesn't come cheap though, with N2 selling as a "diskless" shell for $600, with two 1TB drives for $900, 4TB for $1,000, 6TB for $1,500, and 8TB for $2,000. It includes a one-year hardware warranty and one year of data-recovery service, so even if both hard drives are damaged, ioSafe will pay up to $2,500 per terabyte to recover your data.

For all those Benjamins, you receive the N2's ability to withstand up to 1,550 degrees Fahrenheit (or 843 C) for 30 minutes and up to 72 hours submerged in as much as 10 feet of water. The ioSafe N2 can be set up as a "data safe," in that it can be secured with a Kensington lock or bolted to the floor using holes located at the bottom of the drive.

The rear of the N2 features a Gigabit Ethernet port and two USB 3.0 ports for adding more storage to your network, or for a print server. The front of the case features a USB 2.0 port, SD card reader, and a copy button that allows you to copy all the contents of a SD card or USB drive to the N2—a great feature that lets you make a quick backup without a PC. IoSafe's N2 is based on Synology's NAS server platform, which features a slick user interface with logical menus and an expansive software collection. Even better, no software needs to be installed in order to access the unit from any web browser to configure the drive and run applications. The software lets you run a range of utilities to stream media, download torrents, host your own web server, and a lot more.

The N2 we reviewed came with two 1TB 7,200rpm Seagate Barracuda drives, and on our office network the N2 displayed decent read speeds of 62MB/s and write speeds of 71MB/s, which is a bit slower than USB 3.0 but not too shabby. To test its fireproof and waterproof claims, we placed the N2 in a BBQ pit, then after 22 minutes, we completely submerged the 28-pound NAS in a bucket of water. When we eventually removed the hard drives from the case they were completely dry and unaffected. To recover data from the ioSafe N2 with a PC, we needed to boot into Ubuntu (from a Live USB key) and follow a tutorial from the Synology FAQ, which was a lot of work and a lot more tedious than we would have liked, but it worked fine and our data was recovered.

The ioSafe N2 NAS RAID certainly kicks ass. It's literally the surest way to keep local data safe that we have ever seen. We just wish the data recovery process were a bit easier. –JULIAN REICHE

VERDICT 9 KICK ASS!

ioSafe N2 NAS RAID

FIRE SALE Fireproof and waterproof; data recovery included; great software.

GETTING FIRED Heavy; expensive; data recovery is tedious.

$900, www.iosafe.com



SanDisk's new media drives are easy to use and make wireless media streaming a cinch.

SanDisk Connect Media and Flash Drives

Media streaming for newbs

IF YOU'VE EVER wished you could just leave your USB key on your desk or in your pocket and still access the files on it wirelessly, SanDisk's new media drives are sort of what you're looking for. Unfortunately for power users, these wireless media drives don't quite fit the bill when it comes to file sharing, but they are great for sharing media with portable devices, and they are dead simple to use, too. They also double as pocket-ready Wi-Fi access points.

Here's how these devices work. First, you connect them to a PC or Mac and copy files to pre-designated folders for music, movies, pictures, and files. Next, people within 150 feet must switch their device's Wi-Fi to the SanDisk access point, and then run a free SanDisk app to access all the content on the drives. Connected users can also download and upload data to the drive, but all that data is only accessible from the SanDisk app, which is a pain. You can also password protect the access point, but it's not turned on by default, which seems a bit unsafe to us.

Both the USB key and the media drive are battery-powered, so you just plug them into a USB port to charge them. The Media Drive offers eight hours of streaming per charge, and is available in 32GB and 64GB capacities, but has an SD card slot, so you could take it all the way up to 192GB. The smaller Flash Drive offers four hours per charge, and is simply a shell for a Micro SD drive. It's available in both 16GB and 32GB capacities. Both drives are USB 2.0, so copying data to them is painfully slow, and is easily their biggest weakness.

The free SanDisk app required for media streaming is available on the Google Play, Apple iOS, or Amazon Kindle store (sadly, it looks like Windows Phone users are out in the cold on this one, but they are probably used to it by now). We were also able to access the files from a laptop, but could not send data to the device. We were impressed by how smoothly content streamed from the device. SanDisk says it works at a distance of 150 feet, and we confirmed this in testing. Both devices can stream several movies at once (eight for the Media Drive, three for the Flash Drive), though the built-in player can only stream MP4 files, so AVI and MPG files won't play, which is bogus.

Ultimately, we found these devices to be easy to carry, set up, and operate. They are a bit limited in how they function due to their family-friendly nature, but if you're just looking to share media with friends on a plane or in a hotel room, they are hard to beat. Anyone wanting more advanced file sharing will have to look elsewhere—this isn't designed to replace your NAS drive. As it stands, it's one of the easiest ways we've seen to share media to a tablet or phone, but it's not the easiest to work with a laptop. The free iOS app also has limited file-format support. The last major downside is its slow USB 2.0 speeds, which makes file copying agonizing. –**JOSH NOREM**

VERDICT 8

SanDisk Connect Media and Flash Drives

+ MEDIA Simple file sharing; works on most devices; very portable; easy setup.

– MADEA Difficult for laptops; won't play many video formats; slow USB 2.0 file transfers.

$50–$100, www.sandisk.com



The top of the Leap Motion contains a motion-sensing camera, which probably won't capture your disappointment.

Leap Motion

Motion-sensing controller lands with a thud

CONSIDERING HOW rapidly technology advances, the longevity of the humble computer mouse gets more fascinating every day. Sure, we've added a scroll wheel, switched to digital tracking, and sometimes go wireless, but its basic shape and behavior remains unchanged. The Leap Motion is not necessarily designed to replace it—but after our time with it, we're not sure where it would fit in on the desktop.

We know that it's a dual-lens, IR-sensitive motion controller similar to the Xbox Kinect, and Leap Motion's creator (a company helpfully named "Leap Motion") claims its own device is more accurate. It has partnerships with Asus and HP, and millions in venture capital funding. This is a serious product that you can get at Amazon or your local Best Buy, with an MSRP of $80. It's the size of a small candy bar, and it attaches quickly with a bundled USB cable.

However, it doesn't replace your mouse. It can, but that requires a third-party app called Touchless. It's free from Leap Motion's Airspace app store, but it doesn't work that well, and it doesn't function in games. That requires another third-party app called GameWave, which costs $3.99. The Leap Motion seems to behave better with GameWave, but only by degrees; it consistently demonstrated a lack of precision required to interact with onscreen buttons sized for a mouse. The pointer drifted too much and lagged slightly behind our movement.

We played Civilization V, which was officially confirmed to work with GameWave, but we had to constantly re-center the screen with our mouse; pulling a hand away from the screen caused the pointer to move to its edge, which caused the map to scroll. We also tested it on a 27-inch 2560x1440 monitor, and our hand frequently moved too far away from the Leap Motion, because of the sheer area that needed to be tracked. If you increase acceleration, though, your tracking gets less accurate. This is definitely not an "it just works" experience.

But getting back to the Airspace store: That's the intended ecosystem, apparently. Not your current desktop software or games. This frustrates for a few reasons. Mainly, store navigation is oddly poor. You can't sort by popularity, rating, price, or release date. Only by category. When you do, the results are not alphabetical, or otherwise auto-sorted by any clear mechanism. The other problem is the small inventory. The "Top Picks" section seems to showcase relatively highly rated apps, but there were only 27 to choose from, one of which appeared to be a placeholder. As this issue went to press, there was a grand total of 70 Leap Motion apps that were compatible with Windows (some are Mac-only). Many are just converted Android or iOS apps, like Dropchord or Fruit Ninja.

The store also explicitly forbids app refunds, unless the app is "defective" according to Leap Motion's sole discretion. And we couldn't find any demo versions of the paid apps, which form the bulk of the store's contents. Most cost only a few dollars, but after forking over $80 for the device, discovering that you can't use it as a mouse out-of-the-box, fiddling extensively with the third-party apps that give it mouse functions and still not getting the precision that you want, the platform doesn't exactly invite you to gamble more money on something that might justify the purchase of the device. –TOM MCNAMARA

VERDICT 6

Leap Motion

+ **MOTION IN THE OCEAN** Easy set-up; small footprint; looks nice.

– **MOTION SICKNESS** Lacks precision; third-party apps required; app store needs work.

$80, www.leapmotion.com

The Chromecast is a snap to set up—just plug it into your HDMI port.



Google Chromecast

Best deal in 1080p streaming

IT MAY BE SMALL, but Google's new tiny, key-shaped black HDMI dongle makes a massive impact on the crowded streaming-device market in ease-of-use and pricing.

Setting up the Chromecast is easy and amazingly clever. Just plug the Chromecast into an HDMI port and power it up via USB (Google bundles a wall wart if your TV/monitor doesn't have USB). From the wireless network you plan to mount the Chromecast to, simply download the Chromecast Google Chrome plugin from www.google.com/chromecast/setup and it will connect to the Chromecast via Wi-Fi and finish the setup. You can set up the Chromecast from any Android Wi-Fi-enabled device running 2.3 or up, as well as any PC, Mac, or iOS device. You can even set up the Chromecast from a Chromebook, although Google only lists the Chromebook Pixel as being supported.

With the plugin installed on the Chrome browser on your PC, you'll find a new Chromecast button in the two primary services supported: Netflix and YouTube. You'll also find a Chromecast button on your Android or iOS apps if you have the latest version of YouTube or Netflix installed. Clicking the button casts the video to the HDTV the Chromecast is plugged into. The content isn't actually streamed from Netflix or YouTube directly to your PC and then on to your TV—the Chromecast gets fed the stream directly from the services, so you can continue to use your phone, tablet, or PC, or even power them down.

Google's Chromecast displays in crystal-clear 1080p, unlike many other bargain streamers, which only display in 720p. We found that there was no lag or drops in image quality when streaming both YouTube and Netflix videos on our 10-megabit connection. Our videos sometimes took a while to buffer, but after that we were treated to a silky-smooth viewing experience.

The Chromecast's advantage over other cheap streamers is apparent when searching for titles to watch. Instead of an awkward, clunky remote as a navigation tool, you use your phone or tablet's virtual keyboard, or the PC's keyboard.

The third function (which is still in beta) is the mirroring feature, which lets you clone your PC's browser to the Chromecast. When we first tried the mirroring function, we found it to be slow, laggy, and unresponsive. A firmware update helped reduce some of the choppiness but it still wasn't ready for prime time. So, what's the deal? We suspect it has to do with the network. Trying to mirror a screen from an Ultrabook over Wi-Fi gave us the usual dropped frames, but once we plugged the same Ultrabook into a LAN port, the streaming greatly improved. We're not sure if it's a router issue, as the wireless must deal with three streams (one to your PC, one back to the router, and then a third to the Chromecast) or just the fact that the feature is in beta. Right now, we'd recommend that you stick with a hard wire, though. Even when it works, however, mirroring is limited to 720p.

The Chromecast features a bargain-bin price of $35, which is much cheaper than other 1080p streaming devices, which usually run about $60, and don't offer Chromecast's killer app, YouTube. The device is easy to set up and use, and using a phone's keyboard is a huge improvement over using a remote. We'll take the Chromecast's superior input methods and its two mega apps, Netflix and YouTube, over any other streamer today. –CHRIS ZELE

VERDICT 9

Google Chromecast

+ PC GAMING Inexpensive; displays YouTube and Netflix in 1080p; easy to set up; simple to use.

– MOBILE GAMING Mirroring function still needs some work.

$35, www.google.com/chromecast



Glowing doors scattered throughout the land are your ticket out of the Saints Row Matrix.

Saints Row IV

Whatever Volition's drinking, we'll have two

IT'S SAFE TO SAY that Volition has officially given up on any semblance of rationality in its Saints Row franchise. And you know what? That's perfectly fine. There's no need to play the heavy-realism card in a series that encourages you to kill people using giant, floppy genitalia or, our favorite, a "Dub-step Gun" that's every bit as *wub-wubbin'* fun as its name implies.

Saints Row IV is allegedly the last official iteration in the current Saints Row plotline, a T&A-filled romp stretching all the way back to the first Saints Row title in 2006. If you're tuning into Saints Row IV with the expectation that the game's traditional gang-on-gang gameplay has just been given a bit of a face-lift and put out to pasture, hold on to your butt. Or any butts, really.

We almost don't want to give away any hint of the plot, given that the game's absurd (and necessary) twist is a delight to get thrown right into. Suffice it to say, Saints Row IV quickly takes a *Matrix*-like turn when badass newcomer alien Zinyak (who sounds like the distant cousin to *The Lion King*'s Scar) abducts the Saints Row crew and banishes them to a digital re-creation of Steelport.

You then spend a chunk of the game's main missions trying to rescue your friends (and a few extras) who are all trapped in individual simulations of their own. Hello, *Inception*. This setup does allow Volition's designers to stretch their creative muscles a bit throughout the game's primary plot—or, in some cases, shotgun a few beers and go buck-wild with some of their ideas. Some of the absurdity works; some doesn't (a 1950s nuclear family scenario is a bit more tedious than terrific). We appreciate Volition's creativity even though it comes at the expense of challenging gameplay in the main storyline's action sequences.

Saints Row IV is much more Crackdown than Grand Theft Auto this time around. The twist on technique freshens up the game, but it also overshadows some of the more legacy franchise features that stuck along for the ride.

To stretch the *Matrix* analogy to its breaking point, your character is akin to Neo. You start out as a total newbie within Zinyak's digital re-creation, but the game tosses you pretty far down the rabbit hole soon enough. Your character gains super speed; you acquire jumping powers that let you take wild leaps all around the map; you can run up the sides of buildings; you take no fall damage; you are an unnamed protagonist, destroyer of worlds.

And those are just the always-on powers. In addition to your considerable arsenal of upgradable guns, alien guns, and all sorts of other pew-pew-based mayhem, you can toggle between one of four themed powers to equip at any given time. These powers can themselves be swapped around and upgraded at will: Nuke everyone with fireballs or freeze and shatter them with ice orbs; telekinetically toss cars at baddies or lift aliens up into the air and transform them into lightning rods; set yourself on fire to immolate everyone else around you—just to name a few uses.

The best part about feeling like a god among men within Saints Row IV is the versatility it offers when you start to feel the slightest bit bored with the game's considerable number of things to do. Tired of shooting aliens? Set them ablaze. Tired of burning aliens? Jump in the air and stomp on them. Tired of fighting? Use the power that allows you to convert enemies to your side and let them do the work for you.

The downside, however, is that Saints Row IV doesn't feel all that challenging. Not once during our play-through on the game's standard difficulty (we know,



Why, yes, you're fighting a giant energy-drink mascot. Nothing weird about that in Saints Row IV.



Saints Row IV pokes plenty of fun at pop culture, as well as video games (with cardboard-box stealth).

we know) did we feel the slightest bit ill-equipped to unleash eight different kinds of hell on anything we came across. In fact, we didn't die—not once. There was no encounter so difficult that it couldn't be solved with a well-timed rocket (the alien gun practically gives you unlimited ammunition) and a mad sprint toward one of the many health boosts dropped by fallen enemies or civilians caught in the crossfire.

Our character's godlike special powers, fully upgraded (and often absurd) weaponry, and our progression through the game's additional character upgrade options made us completely forget about some of the core mechanics the Saints Row franchise is known for. Take driving, for example. There's not much of a point to stealing, driving, or customizing cars when your character is the Saints Row equivalent of Sonic the Hedgehog.

Homies? You don't need to call in the artillery if you *are* the artillery. It does take a little bit of the joy out of phoning up your friends (or upgrading them) for a little assistance when you can outrun, out-jump, and out-shoot your crew by a country mile.

As long as you don't mind your near-invincible status, Saints Row IV comes with an absurd amount of quests to undertake, mini-games to play, and collectables to pick up. Volition uses the same styling as previous Saints Row games, littering the landscape with mini-games that you activate merely by walking over to them.

We enjoy the diversity—everything from the tried-and-true "blow up as much as you can within [x] minutes," to the addition of new timed jumping races and a stranger "throw things through hoops" telekinetic game. That said, we wouldn't mind even more variety in future Saints Row titles—up to and including more unique, themed mini-games in the same styling as Saints Row IV's exceedingly quirky story missions.

As for the collectables, Volition took one look at the Crackdown series—whose upgrade system is primarily based on finding stuff scattered around the landscape—and crossed out the "down" part. This game is on crack, given the number of objects that it expects you to find littered throughout Steelport's considerable landscape—easily pushing past 1,000 in total. Collecting significant portions of the game's main orb "clusters" hasn't just been designed for your fun and amusement; these clusters are also the currency that allows you to upgrade your formidable superpowers into even nastier, faster-charging effects.

It's important to take a step back from nitpicking, however, and consider the sum of Saints Row IV's silly parts. This has never been a franchise that's taken itself very seriously. And yet, somehow, this complete lack of regard for conventionality has allowed Volition to craft a title that's every bit immersive as it is strange, self-deprecating, and—yes—sexy (Volition does love its pixilated nakedness).

Even with some of the Saints Row franchise's vestigial elements sticking along for the amped-up ride, Saints Row IV does a great job of straddling the line between crazy and weird. It's hard to predict just about anything in this game, because you never quite know what new direction Volition's going to take with a side mission, a new weapon type, or an unlockable. One minute you're paying homage to Call of Duty (and listening to Aerosmith, of all things); the next, you're walking around in a giant robot punching everything in sight. Later, you're shooting down a Godzilla-like soda can that is trying to kill you with rockets. Seriously.

It's this very unpredictability that makes us feel as if Volition's trying to blind gamers to the few flaws in Saints Row IV by taking them on one of the craziest trips this franchise has yet seen. And you know what? It works. While we'd be happy if we never had to play a tile-puzzle hacking game to unlock a store ever again, this funny, bawdy title knows what its audience wants and expects—shooting and stupidity. And, boy, does it deliver. –**DAVID MURPHY**

VERDICT 9

Saints Row IV

+ GRUMPY CAT Hilarious, absurd gameplay; diverse (and ample) superpowers and guns; co-op multiplayer; plenty of collectibles.

– PROFESSOR GENKI Missions occasionally try too hard; driving and homie help virtually eliminated from game; not especially challenging.

$50, www.saintsrow.com, ESRB: M

LAB NOTES

CHRIS ZELE **INTERN**



So Long, Maximum PC

Thanks for the memories (and the "free" hardware)

I HAD THE MOST awesome year contributing to *Maximum PC* as an intern. I enjoyed learning from the staff about CPUs, GPUs, SSDs, and other things that I never knew about hardware.

The experience here has opened doors for me and I'll be moving on to *PC Gamer,* where I will be a Contributing Editor. I'm going to miss the Max PC crew immensely, and the discussions we had on random tech happenings and news. Hearing Gordon debate with other editors and our art director Rich was great, as it was like having a rant every day of the week.

I'll be finishing up my undergraduate degree at San Francisco State University this year, so when that's done hopefully I'll be able to get a full-time editorial position somewhere. *Maximum PC* has been a lot of fun, and I appreciate all time the editors spent showing me the ropes and teaching me about the tech industry!





Jimmy Thang
Online Managing Editor

Just as I got an Asus RT-N66U, Netgear sued Asus for allegedly violating FCC safety regulations in its routers (and eating into its business). While the verdict is undecided as yet, I'm certain that if we find out that all these wireless signals are bad for us, we'll largely go on ignoring them. Threats of cancer, be damned—there's no stopping society's Internet addiction.



Katherine Stevenson
Editor-in-Chief

I've been using the new Nexus 7 tablet lately (my review of it will appear in next month's issue), and I'm still not sure I really need this device in my life. Between my 4-inch Samsung Galaxy S III phone, which I take with me everywhere, the laptop I use for anything resembling work, and the Kindle I love for ebooks, I'm struggling to incorporate this new addition into the mix.



Josh Norem
Senior Editor

This summer, I've been tackling my to-do list, which includes moving my GPU testing platform out of the Cooler Master Cosmos II chassis and into something a bit more manageable. I love that it can hold four GPUs and 12 hard drives, but I don't like that it takes two people and a horse to move it. A smaller version would certainly hit the spot.



Tom McNamara
Associate Editor

I was happy to see AMD release a driver that addressed most of its CrossFire stuttering issues. Everybody benefits when the competition stays strong. In another example, it looks like the latest Humble Bundle will cross the $10 million mark, and most of that goes to charities for cancer research, medical care, and human rights, as EA has elected to take no cut.

LETTERS

WE TACKLE TOUGH READER QUESTIONS ON...

> Voltage Hack
> Model M Keyboard
> Dream Machine GPUs

Feeding the Beast

What's the solution to hitting the limit of power available from your wall socket? The answer is to run two or more circuits to the room. With the increasing amount of electricity that a household consumes, it should become a standard, just like the 200A service that a typical house would have these days.

But a quicker fix is at hand—take over the kitchen! Look behind your electric stove (or drier, in some cases). If you know how to do it or know someone who does, you can split that 240V line into two 120V lines. Stick two 1,200W PSUs in the case and you'd have the power you want with room to spare for other devices.

No stove to cook with? BBQ with a cold beer (or two), anyone? Or hang your clothes to dry. It's more green anyway and compensates somewhat for the power that the monster PC would suck up.

—Howard Wong

DEPUTY EDITOR GORDON MAH UNG RESPONDS: You're right, Howard. Nothing says hardcore, old-school computing like working on a PC right next to the washer/drier in the basement. The beige color of our Dream Machine would mix right in with the wood paneling, too.

What Were We Thinking?

Something in your August 2013 letters section has been bothering me. Why would you suggest to Steve Ruegsegger to back up all of his data, do a clean install of Windows 8, clone that clean install to his new SSD, then restore his data from the backup he made in step one? Why not just install Windows 8 to his new SSD and then connect his old hard drive as storage and have access to his data there? Also, I know a clean install is always best, but couldn't he just upgrade to Windows 8, keeping all his programs and data intact, then clone it to the new SSD? Once his old drive is cloned to the new SSD, would the upgrade versus clean install performance hit be so great so as to not provide this suggestion?

—Joe Sawaya

SENIOR EDITOR JOSH NOREM RESPONDS: We wholeheartedly endorse the technique you describe of performing a clean install and just accessing data from the old OS drive, or copying it over to the SSD after the OS is installed. We went back and read our reply and you're right: It does sound convoluted to us now. Plus it is possible to clone your existing installation to a new SSD since some vendors include software to do this, but since he was talking about installing Windows 8, we always, always, always recommend a clean install for your OS. Taking your advice, we'd buy the new SSD, install Windows 8 to it, reinstall our programs, then attach the old drive to the system for access to data.

Maximum Thumb Drive

I enjoyed your recent thumb-drive utility article (September 2013) but it failed to include the newest and greatest utilities. Using RMPrepUSB with Grub4DOS and Easy2Boot, I created one flash drive that does almost everything. I now have one flash drive that will install all recent Windows versions from ISOs, boot or install Linux distributions like Mint or Parted Magic from ISOs, boot and run Hiren's Boot CD, and boot and run Samsung's SSD Secure Erase Utility.

—Mike Sandstrom

The Beloved Model M

For the first time since I began reading *Maximum PC* in the late '90s, I felt compelled to write and say, "Thank you!" I just received my September issue and it just happened to open to the Model M page in your Dream Machine 2013 article. I was shocked and gratified that you would honor your ultimate computer system with a "lowly" PS2 keyboard.

Truth be told, there are still many of us that prefer the Model M for gaming. Sure, it doesn't have the programmable macro keys, fancy LED lighting, or

CUT, COPY, PASTE

Photo credit: The photo in our May 2013 "Software for All" feature of a woman wearing a guinea pig hat was taken by the talented Shannon Foreman.

↘ submit your questions to: comments@maximumpc.com

secondary displays; but if you want instant tactile feedback and to really *know* you hit the keys you wanted without being able to hear them over your headphones, there's nothing better than the Model M. Sure, other companies are producing mechanical key switches, but all are attempting to emulate the sound and feel of the buckling spring design to varying degrees. The key switch travel, key press weight, size and spacing of the keys, the curvature of the tops of the keycaps, and overall heft of the Model M are all ideal in my opinion.

The good news is the venerable Model M is still being produced by Unicomp, which purchased the rights from Lexmark years ago. It's also been updated, if you will, to support USB and the Windows 104-key layout, if that's important to you. The company has several different models to choose from and offers some customization options as well. They can be found at http://pckeyboard.com (no, I don't work for them).

—Ken

EDITOR-IN-CHIEF KATHERINE STEVENSON RESPONDS: Thanks, for seconding our opinion, Ken. We knew the Model M keyboard would be a controversial choice, but for all the reasons you mentioned, we felt it was worthy of Dream Machine status. It's good to know this classic keyboard lives on.

Four GPUs for One Monitor?

In your 2013 Dream Machine, wouldn't a pair of Radeon HD 7990s (or GeForce GTX 690s) have been more than adequate to power that single 4K monitor? As an AMD fanboy, I don't know if the GTX 690 supports DisplayPort 1.2, but I know that the HD 7990 does, and I can't imagine that one monitor—even in 4K—can require more than the HD 7990 offers. If I'm right, and the HD 7990 (and GTX 690) can throw around more muscle than the PQ321 can handle, then I wonder why you didn't either: 1) save yourselves $2,000 by going with dual 7990s or 690s; or, if you absolutely *insisted* on populating all four PCIe slots, go with two or more monitors, to at least make your Titan investment worthwhile?

—Michael Schwobe

SENIOR EDITOR JOSH NOREM RESPONDS: The short answer to your question is, yes, you would need more power than what a GTX 690 or Radeon HD 7990 can provide to run a 4K monitor with all settings maxed out. According to benchmarks reported on AnandTech, a single Radeon HD 7990 will run Metro at 3840x2160 at just 33fps, and a GTX 690 is hobbled by its 2GB frame buffer, achieving just 17fps. Three Titans in SLI hit 55fps, though, and four Titans ran at 61fps, but this is on a Haswell board, so the PCIe bandwidth is likely bottlenecked. Also, nobody is running dual HD 7990s right now because there's an alleged cooling problem that causes the top card to overheat. And dual GTX 690s is too old-school for Dream Machine. Plus, we ran it in 2012 and we don't like to run the same configs twice.

[NOW ONLINE]

KICKSTARTER GAMES THAT RAISED OVER $1 MILLION

Many people think Kickstarter is a godsend for indie game developers, but the unfortunate truth is that most projects go unfunded. With that in mind, we thought we would honor the few titles that have somehow managed to raise over a million dollars. Many of the highly anticipated titles on our list ended up shattering their goals by shocking margins. http://bit.ly/MPCIndy



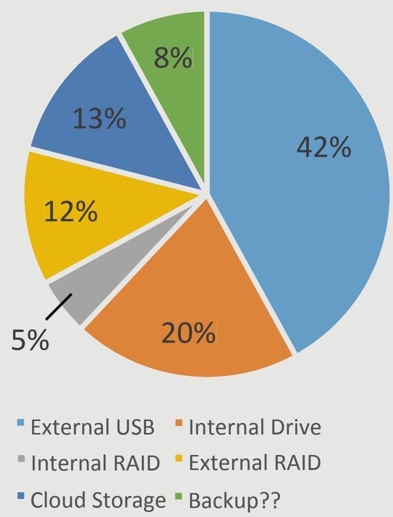
Facebook Polls

Readers Chime in on the Dream Machine

It's been two months since the 2013 Dream Machine was unveiled, so now that it's had some time to sink in, we asked our readers to give us their summary of the Beige Badass.

Rodney J. Thomas: Unadulterated digital ecstasy
Corey Sutlief: The Beige Beast Rides Again
Christopher Pound: Fugly
Scott Powers: Retrorrific!
Ty Collier: Something 007 would use
Billy Walters: Art on the inside, granny panties on the outside
Pro Chan: Dreamy
Dave Hacket: Im... Not... Worthy!
Austin Gibson: Power User's Wet Dream
Gary Diehl: Beige Stealth Powerhouse
David Olsen: Obnoxiously silly components and aesthetics
Frosty Winnipeg: Back to Beigics
Jason Stoll: It's what's on the inside that counts
Egor Palchyk: Just like the title, a "dream"!
Steve Swannie: So powerful not even *Maximum PC* could run it

Your Primary Backup Solution Is:



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THE BUILDS

BASELINE



INGREDIENTS

PART		PRICE
Case	Corsair Carbide 300R	$60
PSU	Corsair CX500M 500W **NEW**	$50
Mobo	Gigabyte GA-Z87-UD3H	$150
CPU	Intel Core i5-4670K	$230
Cooler	Cooler Master Hyper 212 Evo	$35
GPU	Sapphire Radeon HD 7950 11196-19-20G	$229
RAM	8GB Corsair Vengeance DDR3/1600	$67
Optical Drive	Samsung SH-224BB	$17
SSD	Samsung 840 Evo 120GB	$109
HDD	Seagate Barracuda 1TB	$70
OS	Windows 8 64-bit OEM	$89

Approximate Price: $1,106

WE KNOW $1,100 seems high for a baseline rig, but we're building to a high standard. This month, we've only made one big change, which is an upgrade from the Corsair Carbide 200R to the roomier Carbide 300R. The 300R has more front air intakes and larger front fans, more cable routing options, and side-panel fan mounts that aren't obstructed by a "tower" CPU cooler. We also like its pre-drilled holes for routing a custom water-cooling loop to an exterior radiator and/or reservoir. Otherwise, the rest of the parts are carried over from last month, since they are still the best parts for the money that we can find. We considered swapping the GPU to the GeForce GTX 760, but AMD's "Never Settle Forever" bundle gives the HD 7950 the edge.

PERFORMANCE



INGREDIENTS

PART		PRICE
Case	NZXT Phantom 530	$130
PSU	Corsair HX850	$146
Mobo	Asus Sabertooth X79	$313
CPU	Intel Core i7-3820	$290
Cooler	Corsair H80i **NEW**	$75
GPU	EVGA GeForce GTX 780 ACX	$660
RAM	4x 4GB Corsair Vengeance DDR3/1600	$124
Optical Drive	Asus BW-12B1ST	$60
SSD	Samsung 840 Pro 256GB **NEW**	$225
HDD	Seagate Barracuda 3TB	$135
OS	Windows 8 64-bit OEM	$89

Approximate Price: $2,247

AS WE WENT TO PRESS, Intel's Ivy Bridge-E CPU had not landed in the Lab, so we're sticking with its older brother, Sandy Bridge-E. We could go with a Haswell system, but we like the extra PCI Express bandwidth of the LGA2011 platform, as well as the option to upgrade to a six-core CPU. We did change the CPU cooler, though, swapping the NZXT Kraken X40 for the Corsair H80i. Both are very good, but the H80i was less expensive this month, and its five-year warranty is three years longer than the Kraken's, so in it goes. We also ditched the Samsung 840 Evo in favor of the slightly faster and longer-warrantied 840 Pro, as Samsung says it'll soon receive the same DRAM-caching "Rapid Mode" as the Evo.



ULTRA

THERE HAVE BEEN some interesting developments in the video card world since we last updated the Ultra build. The biggest is that AMD slashed the price of its dual-GPU Radeon HD 7990 from $1,000 to around $700. This means two of these cards are only $80 more than two Nvidia GeForce GTX 780s, and that particular combo would crush the Nvidia tag-team, with its four AMD flagship Tahiti cores. The problem is, we haven't had the opportunity to test two HD 7990s together, and we've seen credible reports that the upper card can overheat, due to some quirks in the cards' cooling setups. We've also not had a chance to fully test the new frame-pacing driver with a wide variety of games, and if we're going to be dropping $1,400 on one area of a build, we want to be confident that it will be flawless. For these reasons, we're sticking with dual GTX 780s for now, which is still a buttload of horsepower. And just like the Performance build, we're sticking with Sandy Bridge-E until Ivy Bridge-E arrives.

For more of our component recommendations, visit www.maximumpc.com/best-of-the-best.

INGREDIENTS

PART		PRICE
Case	Corsair Obsidian 900D	$350
PSU	XFX ProSeries 1,250W P1-1250-BEFX	$210
Mobo	Asus P9X79 Deluxe	$350
CPU	Intel Core i7-3930K	$564
Cooler	Corsair H100i	$95
GPU	2x EVGA Nvidia GeForce GTX 780 SC ACX	$1,320
RAM	4x 4GB Corsair Vengeance DDR3/1600	$124
Optical Drive	Asus BC-12B1ST BD-R burner	$60
SSD	Samsung 840 Pro 512GB	$430
HDD	Seagate Barracuda 3TB	$135
OS	Windows 8 Professional 64-bit	$130

Approximate Price: $3,768

UPGRADE OF THE MONTH
GOOGLE CHROMECAST



This isn't a PC upgrade, but it does upgrade your TV into a smart TV, allowing it to "cast" a stream from Netflix or YouTube at 1080p (using your smartphone or tablet as a remote control and content navigator). Your PC can already do this, but now you can send it to the TV and chill on the couch! You may even find one in stock by the time you read this.
$35, www.google.com/chromecast

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